Reference Manual
00809-0100-4027, Rev AA
December 2005

Rosemount 4500
Hygienic Pressure Transmitter for Life Sciences Applications

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HART® FIELD COMMUNICATIONS PROTOCOL

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Process Management

Reference Manual
00809-0100-4027, Rev AA
December 2005

Rosemount 4500 Hygienic Pressure Transmitter

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

Rosemount Inc. has two toll-free assistance numbers:

Customer Central
Technical support, quoting, and order-related questions.

United States - 1-800-999-9307 (7:00 am to 7:00 pm CST)

Asia Pacific- 65 777 8211

Europe/ Middle East/ Africa - 49 (8153) 9390

North American Response Center
Equipment service needs.

1-800-654-7768 (24 hours—includes Canada)

Outside of these areas, contact your local Rosemount® representative.

⚠CAUTION

The products described in this document are NOT designed for nuclear-qualified applications. Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Rosemount Sales Representative.

Rosemount 4500 Pressure Transmitters may be protected by one or more of the following U.S. Patent Nos. 4,370,890; 4,466,290; 4,612,812; 4,791,352; 4,798,089; 4,818,994; 4,833,922; 4,866,435; 4,926,340; 4,988,990; and 5,028,746. Mexico Patentado No. 154,961. May depend on model. Other foreign patents issued and pending.

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Section 1 Introduction

Using This Manual . . . . . page 1-1
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USING THIS MANUAL

The sections in this manual provides information on installing, operating, and maintaining the Rosemount 4500 pressure transmitter. The sections are organized as follows:

- **Section 2: Installation** contains mechanical and electrical installation instructions, and field upgrade options.
- **Section 3: Configuration** provides instruction on commissioning and operating 4500 transmitters. Information on software functions, configuration parameters, and online variables is also included.
- **Section 4: Operation and Maintenance** contains operation and maintenance techniques.
- **Section 5: Troubleshooting** provides troubleshooting techniques for the most common operating problems.
- **Appendix A: Reference Data** supplies reference and specification data, as well as ordering information.
- **Appendix B: Product Certificates** contains intrinsic safety approval information, European ATEX directive information, and approval drawings.

SERVICE SUPPORT

To expedite the return process outside of the United States, contact the nearest Rosemount representative.

Within the United States, call the Rosemount National Response Center using the 1-800-654-RSMT (7768) toll-free number. This center, available 24 hours a day, will assist you with any needed information or materials.

The center will ask for product model and serial numbers, and will provide a Return Material Authorization (RMA) number. The center will also ask for the process material to which the product was last exposed.

⚠CAUTION

Individuals who handle products exposed to a hazardous substance can avoid injury if they are informed of and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

Rosemount National Response Center representatives will explain the additional information and procedures necessary to return goods exposed to hazardous substances.

Section 2 Installation

Considerations . . . . . page 2-2
Installation Procedures . . . . . page 2-4
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OVERVIEW

The information in this section covers installation considerations. A Quick Installation Guide (document number 00825-0100-4027) is shipped with every transmitter to describe basic pipe-fitting and wiring procedures for initial installation. Dimensional drawings for each Rosemount 4500 variation and mounting configuration are included in Appendix A: Reference Data.

HART Communicator and AMS instructions are given to perform configuration functions. For convenience, HART Communicator fast key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operation. Information that raises potential safety issues is indicated with a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals.

Process leaks could result in death or serious injury.

- Install and tighten all clamps and flanges before applying pressure.
- Do not attempt to loosen or remove clamps or flanges while the transmitter is in service.

CONSIDERATIONS

General

Measurement accuracy depends upon proper installation of the transmitter. Mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. Also, consider the need for easy access, personnel safety, practical field calibration, and a suitable transmitter environment. Install the transmitter to minimize vibration, shock, and temperature fluctuation.

Environmental

Access requirements and cover installation on page 2-4 can help optimize transmitter performance. Mount the transmitter to minimize ambient temperature changes, vibration, mechanical shock, and to avoid external contact with corrosive materials. Appendix A: Reference Data lists temperature operating limits.

Figure 2-1. Exploded view of the 4500 with optional LCD display

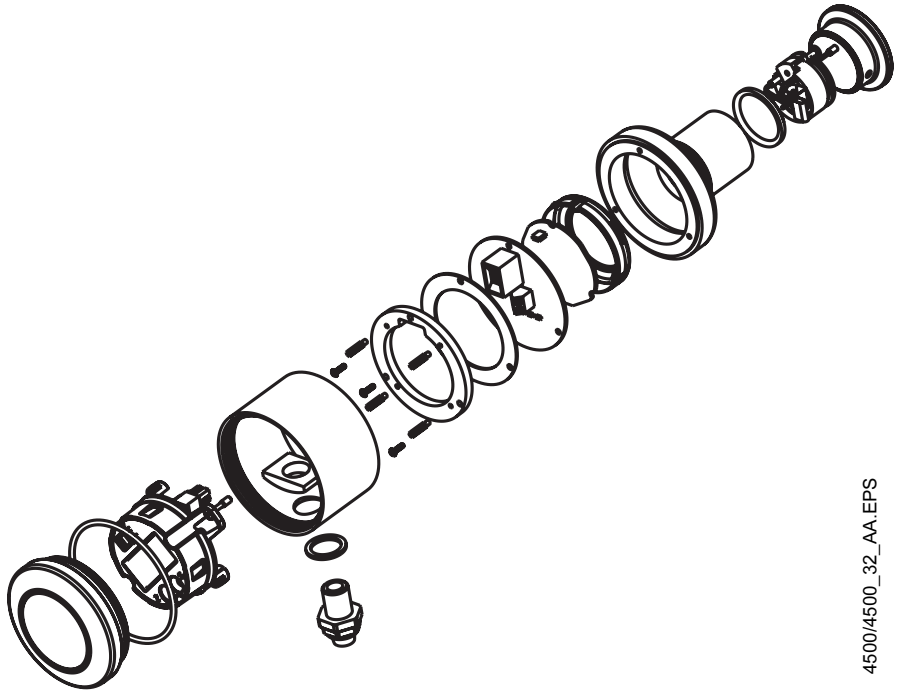
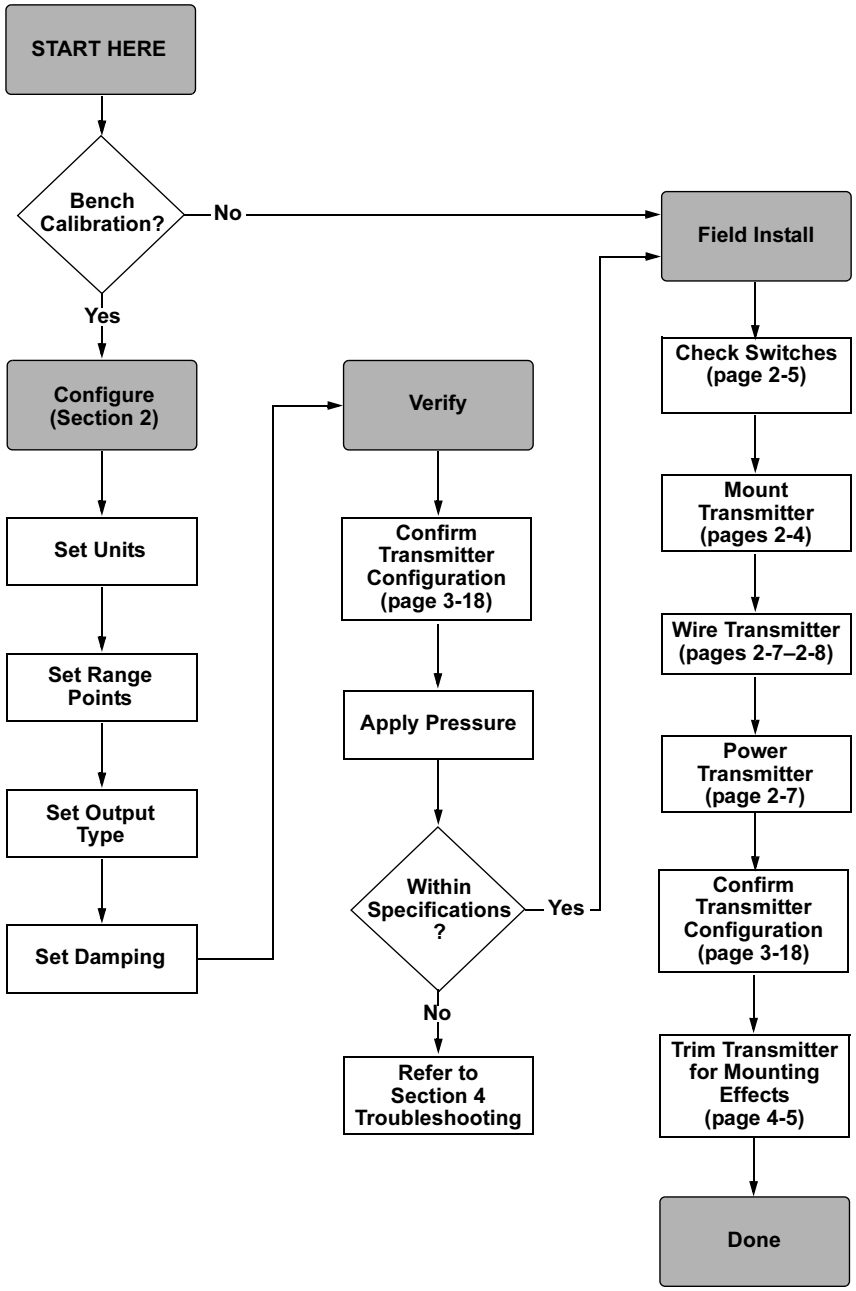


Figure 2-2. HART Installation Flowchart



INSTALLATION PROCEDURES

For dimensional drawing information refer to Appendix A: Reference Data.

Electronics Housing

Provide 0.75 inches (19 mm) of clearance for units without an LCD display. Three inches of clearance is required for cover removal if a meter is installed.

Cover Installation

Always ensure a proper seal by installing the electronics housing cover so the o-ring is engaged. Use Rosemount O-rings.

Mount the Transmitter

The Rosemount 4500 is designed to be mounted directly to a process pipe or vessel using a standard sanitary fitting. The transmitter is available with either a 1.5 or 2-inch Tri-Clamp® connection or a fractional line fitting.

When installing the transmitter to the sanitary fitting it is important to use the proper sanitary clamp and gasket (user-supplied). Check the clamp and gasket specifications before installing. Refer to Table 2-2 for a list of standard sanitary clamps, their respective maximum pressure ranges, and the recommended torque to be applied when mounting.

Figure 2-3. Rosemount 4500 Mounting Configuration Using a Sanitary Fitting

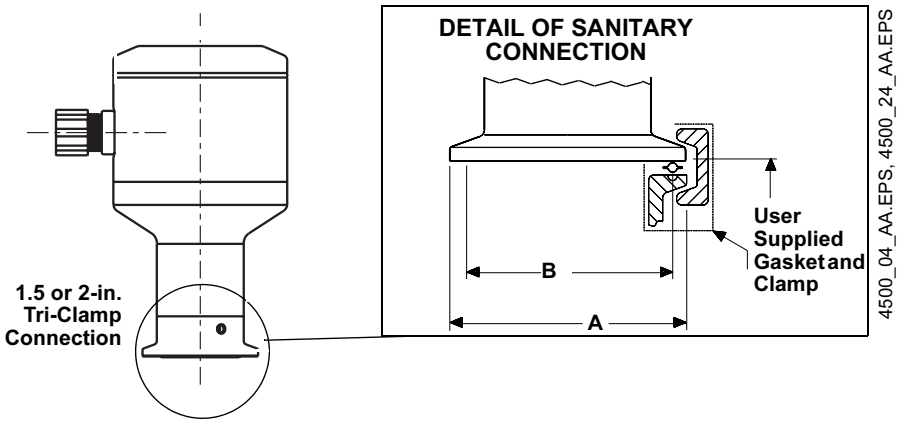


Table 2-1. Connection Size

Description	Connection Size in (mm)	A	B
1 1/2 inch Tri-Clamp	1.50 (38)	1.99 (50)	1.71 (43)
2 inch Tri-Clamp	2.00 (51)	2.52 (64)	2.22 (56)
Fractional Line Fitting	1.50 (38)	1.99 (50)	1.50 (38)

Table 2-2. Standard Sanitary Clamp Models

Clamp Model	psi @ 70 °F (kPa @ 21 °C)	psi @ 250 °F (kPa @ 121 °C)	Recommended Torque
13 MHHM 1.5-inch	450 (3 103)	250 (1 724)	25 in-lb (2.8 N•m)
13 MHHM 2-inch	500 (3 448)	250 (1 724)	25 in-lb (2.8 N•m)
13 MHHS 1.5-inch	600 (4 138)	300 (2 069)	25 in-lb (2.8 N•m)
13 MHHS 2-inch	550 (3 793)	275 (1 896)	25 in-lb (2.8 N•m)
13 MHP 1.5-inch	1500 (10 345)	1200 (8 276)	20 ft-lb (27 N•m)
13 MHP 2-inch	1000 (6 896)	800 (5 517)	20 ft-lb (27 N•m)

NOTE
Sensor burst pressure limits may be less than clamp pressure limits.

NOTE
Most transmitters are calibrated in the vertical position. Mounting the transmitter in any other position will shift the zero point to the equivalent amount of liquid head caused by the varied mounting position. To reset zero point, refer to “Sensor Trim” on page 4-5.

Set Switches

Security (Write Protect)

Changes can be prevented to the transmitter configuration data with the write protection switches on the optional LCD or the switches on the optional LOI board. Position the switch in the “ON” position to prevent change of configuration data.

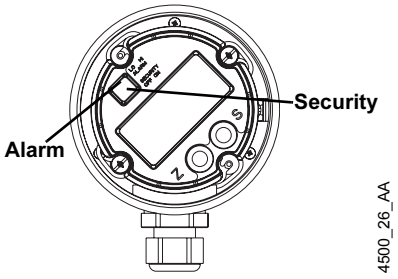
If the transmitter write protection switch is in the “ON” position, the transmitter will not accept any “writes” to its memory. Configuration changes, such as digital trim and reranging, cannot take place when the transmitter security is on.

To reposition the switches, follow the procedure described below.

1. If the transmitter is installed, set the loop to manual and remove power.
2. Remove the electronics compartment cover.
3. Follow the procedure in Figure 2-4 to reposition the switches as desired for the specific housing compartment.
4. Re-install the transmitter cover.

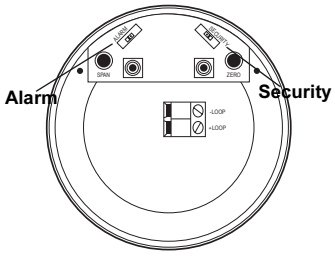
Figure 2-4. Switch configuration

LCD Switches



Slide the security and alarm switches into the preferred position by using a small screwdriver.

LOI Switches



Slide the security and alarm switches into the preferred position by using a small screwdriver.

NOTE
If alarm and security adjustments are not installed, the transmitter will operate normally with the default condition alarm *high* and the security *off*.

HART Communicator

Fast Keys	1, 3, 4, 5

Usage Note
The HART Communicator can be used to configure the security on and off. Otherwise, if the transmitter contains the D1 option, the switch will override any software configuration.

AMS

Right click on the device and select “Device Configuration”, then “Config Write Protect” from the menu.

1. Enter write protect setting, click **Next**.
2. Click **Next** to acknowledge setting has changed. If hardware adjustments are activated, click **Next** to acknowledge the “Switch option detected, function disabled, write protect unchanged” screen. If the hardware adjustments are activated, the write protect will not configure.
3. Click **Finish** to acknowledge the method is complete.

Configure Alarm Direction

The transmitter alarm direction is set by repositioning the Alarm slider switch. Position the switch in the HI position for fail high and in the LO position for fail low.

HART Communicator

Fast Keys	1, 4, 2, 7, 6

Usage Note
The HART Communicator can be used to configure the alarm direction to High (HI) or Low (LO). Otherwise, if the transmitter contains the D1 option, the switch on the transmitter will override the HART Communicator.

AMS

Right click on the device and select “Device Configuration,” then “Alarm/Saturation Levels,” then “Alarm Direction” from the menu.

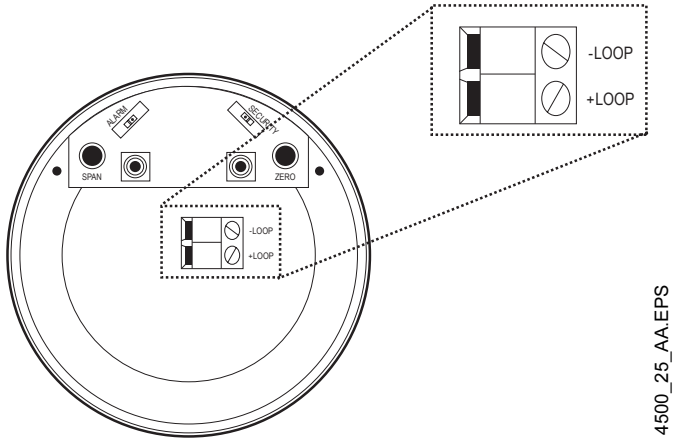
1. Enter desired alarm direction, click **Next**.
2. Click **Next** to acknowledge setting has changed. If hardware adjustments are activated, click **Next** to acknowledge the “Switch option detected, function disabled, alarm direction unchanged” screen. If the hardware adjustments are activated, the write protect will not configure.
3. Click **Finish** to acknowledge the method is complete.

Connect Wiring and Power Up

Wiring for HART Protocol

NOTE
Use shielded twisted pairs to yield best results. To ensure proper communication, use 24 AWG or larger wire, and do not exceed 5000 feet (1 500 meters).

Figure 2-5. HART Terminal Blocks



To make connections, perform the following procedure:

1. Remove the housing cover.
2. Connect the positive lead to the terminal marked (+) and the negative lead to the terminal marked (pwr/comm –).
3. Tighten cord grip to avoid moisture accumulation in the terminal compartment.

Signal Wiring Grounding

Do not run signal wiring in conduit or open trays with power wiring, or near heavy electrical equipment. Ground the signal wiring at any one point on the signal loop, or leave it ungrounded. The negative terminal of the power supply is a recommended grounding point.

Power Supply 4–20 mA Transmitters

The dc power supply should provide power with less than two percent ripple. Total resistance load is the sum of resistance from signal leads and the load resistance of the controller, indicator, and related pieces. Note that the resistance of intrinsic safety barriers, if used, must be included.

See load limitations in Section A: Reference Data.

NOTE
A minimum loop resistance of 250 ohms is required to communicate with a HART Communicator. If a single power supply is used to power more than one 4500 transmitter, the power supply used and circuitry common to the transmitters should not have more than 20 ohms of impedance at 1200 Hz.

Grounding

Transmitter Case

Always ground the transmitter case in accordance with national and local electrical codes. The most effective transmitter case grounding method is a direct connection to earth ground with minimal impedance. Methods for grounding the transmitter case include:

- **Internal Ground Connection**: The Internal Ground Connection screw is inside the electronics housing. The screw is identified by a ground symbol (⏚), and is standard on all 4500 transmitters.

INSTALLING THE LCD METER

Transmitters ordered with the LCD display will be shipped with the display installed. Installing the display on an existing 4500 transmitter requires a small instrument screwdriver and the display kit.

The optional LCD display can be rotated in 90-degree increments.

Use the following procedure to install the LCD display:

1. **IF** the transmitter is installed in a loop, **THEN** secure the loop and disconnect power.
2. Remove the transmitter cover.
3. Engage the four-pin connector from the LCD display into the four-pin receptacle. Tighten screws to secure the LCD.

Note the following LCD temperature limits:

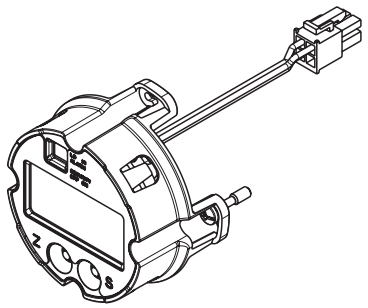
Ambient

32 to 140 °F (0 to 60 °C)

Storage

–22 to 185 °F (–30 to 85 °C)

Figure 2-6. Optional LCD Display



4500/4500_29_AA.EPS

Section 3 Configuration

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Check Output . . . . . page 3-7
Basic Setup . . . . . page 3-8
LCD Display . . . . . page 3-10
Detailed Setup . . . . . page 3-11
Diagnostics and Service . . . . . page 3-18
Advanced Functions for HART Protocol . . . . . page 3-20
Multidrop Communication . . . . . page 3-23

OVERVIEW

This section contains information on commissioning and tasks that should be performed on the bench prior to installation.

HART Communicator and AMS instructions are given to perform configuration functions. For convenience, HART Communicator fast key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Electrical shock can result in death or serious injury.

- Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock.

COMMISSIONING ON THE BENCH WITH HART

Commissioning consists of testing the transmitter and verifying transmitter configuration data. 4500 transmitters can be commissioned either before or after installation. Commissioning the transmitter on the bench before installation using a 375 Field Communicator or AMS ensures that all transmitter components are in working order.

⚠ To commission on the bench, connect the transmitter and the HART Communicator or AMS as shown in Figure 3-1. Make sure the instruments in the loop are installed according to intrinsically-safe or nonincendive field wiring practices before connecting in an explosive atmosphere. Connect HART Communicator leads at any termination point in the signal loop.

For 4–20 mA transmitters, the power supply must provide 11.25 to 30 V dc at the transmitter. To enable communication, a resistance of at least 250 ohms must be present between the HART Communicator loop connection and the power supply. Do not use inductive transient protectors with the 4500.

When using a HART Communicator, any configuration changes made must be sent to the transmitter by using the “Send” key (F2). AMS configuration changes are implemented when the “Apply” button is clicked.

For more information on the 375 Field Communicator see document 00809-0100-4276. AMS help can be found in the AMS on-line guides within the AMS system.

Setting the Loop to Manual

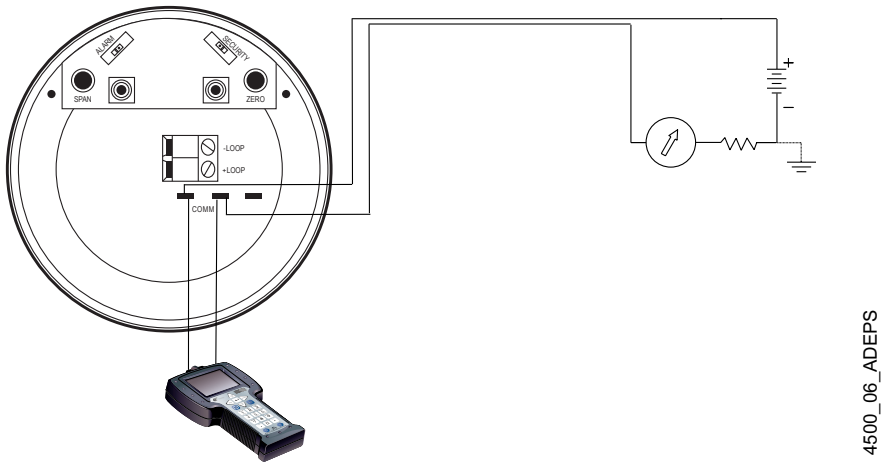
Whenever sending or requesting data that would disrupt the loop or change the output of the transmitter, set the process application loop to manual. The HART Communicator or AMS will prompt you to set the loop to manual when necessary. Acknowledging this prompt does not set the loop to manual. The prompt is only a reminder; set the loop to manual as a separate operation.

Wiring Diagrams

Bench Hook-up

Connect the bench equipment as shown in Figure 3-1, and turn on the HART Communicator by pressing the ON/OFF key or log into AMS. The HART Communicator or AMS will search for a HART-compatible device and indicate when the connection is made. If the HART Communicator or AMS fail to connect, it indicates that no device was found. If this occurs, refer to Section 5: Troubleshooting.

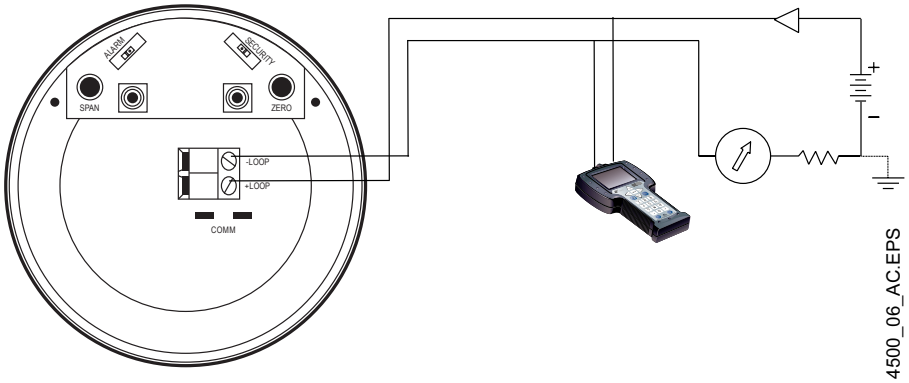
Figure 3-1. Bench Hook-Up



Field Hook-up

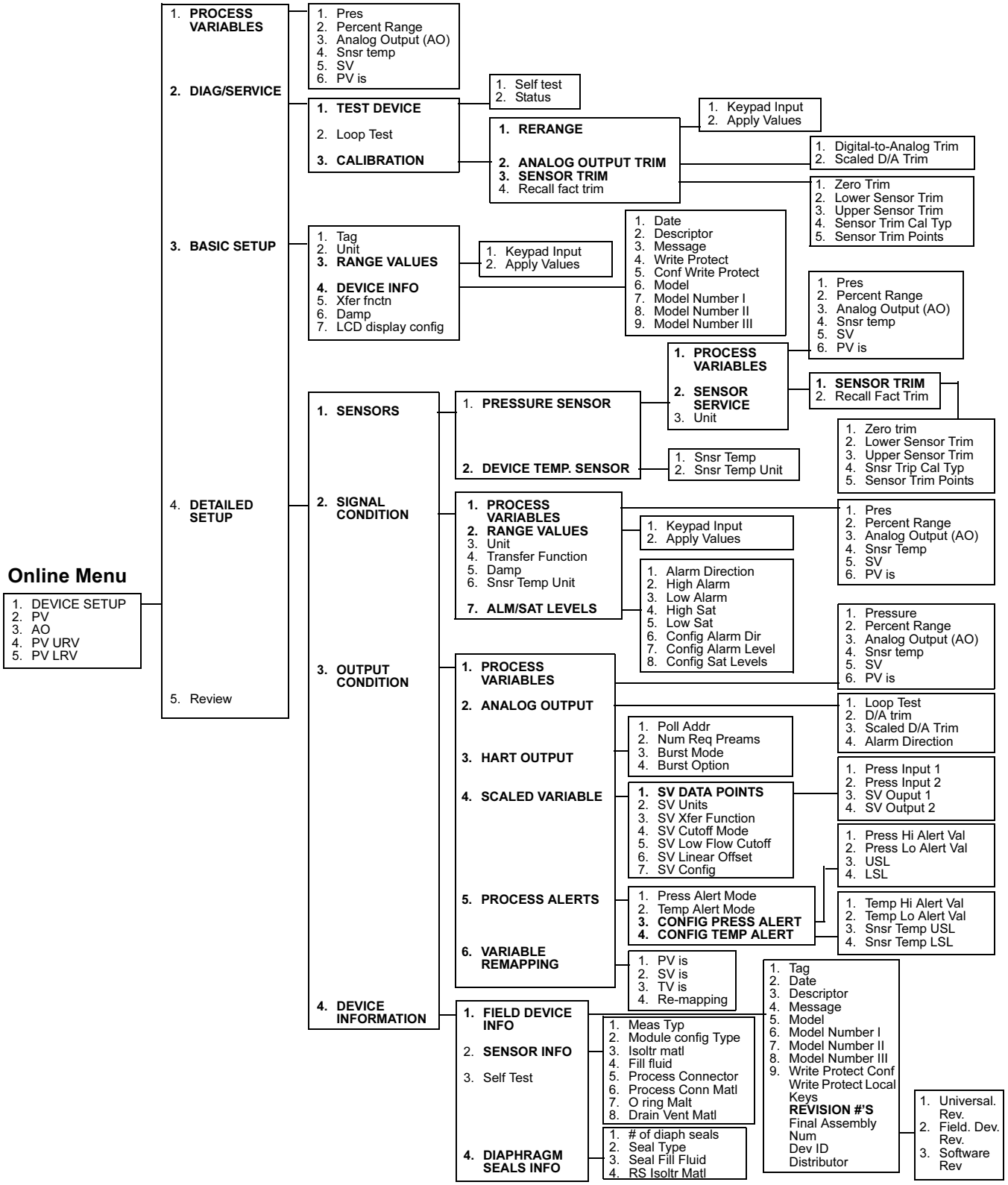
Figure 3-2 illustrates wiring for a field installation with a HART Communicator or AMS.

Figure 3-2. Field Hook-Up



HART COMMUNICATOR

Menu Tree



Fast Key Sequence

The following menu indicates fast key sequences for common functions. For full 375 Field Communicator menu tree see www.rosemount.com.

Function	HART Fast Key Sequence
Alarm Level Configuration	1, 4, 2, 7, 7
Alarm and Saturation Levels	1, 4, 2, 7
Analog Output Alarm Direction	1, 4, 2, 7, 6
Analog Output Trim	1, 2, 3, 2
Burst Mode On/Off	1, 4, 3, 3, 3
Burst Options	1, 4, 3, 3, 4
Damping	1, 3, 6
Date	1, 3, 4, 1
Descriptor	1, 3, 4, 2
Digital To Analog Trim (4-20 mA Output)	1, 2, 3, 2, 1
Field Device Information	1, 4, 4, 1
LCD Display Configuration	1, 3, 7
Loop Test	1, 2, 2
Lower Sensor Trim	1, 2, 3, 3, 2
Message	1, 3, 4, 3
Number of Requested Preambles	1, 4, 3, 3, 2
Pressure Alert Configuration	1, 4, 3, 5, 3
Poll Address	1, 4, 3, 3, 1
Poll a Multidropped Transmitter	Left Arrow, 4, 1, 1
Re-mapping	1, 4, 3, 6, 4
Rerange- Keypad Input	1, 2, 3, 1, 1
Saturation Level Configuration	1, 4, 2, 7, 8
Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2
Scaled Variable Configuration	1, 4, 3, 4, 7
Self Test (Transmitter)	1, 2, 1, 1
Sensor Information	1, 4, 4, 2
Sensor Temperature	1, 1, 4
Sensor Trim	1, 2, 3, 3
Sensor Trim Points	1, 2, 3, 3, 5
Status	1, 2, 1, 2
Tag	1, 3, 1
Temperature Alert Configuration	1, 4, 3, 5, 4
Transfer Function (Setting Output Type)	1, 3, 5
Transmitter Security (Write Protect)	1, 3, 4, 5
Units (Process Variable)	1, 3, 2
Upper Sensor Trim	1, 2, 3, 3, 3
Zero Trim	1, 2, 3, 3, 1

Review Configuration Data

Fast Keys	1, 5

NOTE
Information and procedures in this section that make use of HART Communicator fast key sequences and AMS assume that the transmitter and communication equipment are connected, powered, and operating correctly.

HART Communicator

Before placing the transmitter into operation, review the transmitter configuration data below which was set by the factory.

Manufacturer “Rosemount”	O-Ring material
Transmitter model	Drain/Vent material
Measurement type	Number of diaphragm seals
Module configuration type	Seal type
Range	Remote seal isolator material
PV Unit	Seal fill fluid
PV Lower Sensor Limit (LSL)	Tag
PV Upper Sensor Limit (USL)	Date
PV Lower Range Value (LRV)	Descriptor
PV Upper Range Value (URV)	Message
PV minimum span	Write protect
Lower sensor trim point	Meter type
Upper sensor trim point	Local keys
Sensor trim calibration type	Universal revision
Transfer function	Field device revision
Damping	Software revision
Alarm direction	Hardware revision
High Alarm (Value)	Physical signal code
Low Alarm (Value)	Final assembly number
High saturation	Device ID
Low saturation	Burst mode
Alarm/Saturation type	Burst option
Sensor S/N	Poll address
Isolator material	Number req preams
Fill fluid	Multisensor device
Process connector	Command #39, EEProm Control required
Process connector material	Distributor

AMS

Right click on the device and select “Configuration Properties” from the menu. Select the tabs to review the transmitter configuration data.

CHECK OUTPUT

Before performing other transmitter on-line operations, review the digital output parameters to ensure that the transmitter is operating properly and is configured to the appropriate process variables.

Process Variables

Fast Keys	1, 1

The process variables for the 4500 provide transmitter output, and are continuously updated. The pressure reading in both engineering units and percent of range will continue to track with pressures outside of the defined range from the lower to the upper range limit of the Transmitter.

HART Communicator

The process variable menu displays the following process variables:

- Pressure
- Percent of range
- Analog output
- Sensor temperature
- Scaled Variable (SV)

NOTE
Regardless of the range points, the 4500 will measure and report all readings within the digital limits of the sensor. For example, if the 4 and 20 mA points are set to 0 and 100 psi, and the transmitter detects a pressure of 150 psi, it digitally outputs the 150 psi reading and a 150% of span reading. However, there may be up to ±5.0% error associated with output outside of the range points.

AMS

Right click on the device and select “Process Variables...” from the menu.The process variable screen displays the following process variables:

- Pressure
- Percent of range
- Analog output
- Sensor temperature
- Scaled Variable (SV)

Sensor Temperature

Fast Keys	1, 1, 4

The 4500 contains a temperature sensor near the pressure sensor in the Transmitter. When reading this temperature, keep in mind the sensor is not a process temperature reading.

HART Communicator

Enter the fast key sequence for “Sensor Temperature” to view the sensor temperature reading.

AMS

Right click on the device and select “Process Variables...” from the menu. “Snsr Temp” is the sensor temperature reading.

BASIC SETUP

Set Process Variable Units

Fast Keys	1, 3, 2

The PV Unit command sets the process variable units to allow you to monitor your process using the appropriate units of measure.

HART Communicator

Enter the fast key sequence for "Set Process Variable Units." Select from the following engineering units:

- inH_2O
- inHg
- ftH_2O
- mmH_2O
- mmHg
- psi
- bar
- mbar
- g/cm^2
- kg/cm^2
- Pa
- kPa
- torr
- atm
- MPa
- inH_2O at 4 °C
- mmH_2O at 4 °C

AMS

Right click on the device and select "Configuration Properties" from the menu. In the Basic Setup tab, use "Unit" drop down menu to select units.

Rerange

The Range Values command sets the 4 and 20 mA points (lower and upper range values). In practice, you may reset the transmitter range values as often as necessary to reflect changing process conditions. Changing the lower or upper range point results in similar changes to the span.

NOTE
Transmitters are shipped from Rosemount Inc. fully calibrated per request or to the factory default of full scale (span = upper range limit.)

Use one of the methods below to rerange the transmitter. Each method is unique; examine all options closely before deciding which method works best for your process.

- Rerange with a HART Communicator only.
- Rerange with a pressure input source and a HART Communicator.
- Rerange with a pressure input source and the local zero and span buttons (option D1).
- Rerange with AMS only.
- Rerange with a pressure input source and AMS.

NOTE
If the transmitter security switch is **ON,** adjustments to the zero and span cannot be made. Refer to "Set Switches" on page 2-5 for security information.

Rerange with a HART Communicator Only

Fast Keys	1, 2, 3, 1, 1

The easiest way to rerange is to use the HART Communicator only. This method changes the values of the analog 4 and 20 mA points independently without a pressure input.

From the **HOME** screen, enter the fast key sequence for “Rerange with a Communicator Only.”

1. At “Keypad Input” select 1 and use the keypad to enter lower range value.
2. From “Keypad Input” select 2 and use the key pad to enter upper range value.

Rerange with a Pressure Input Source and HART Communicator

Fast Keys	1, 2, 3, 1, 2

Reranging using the HART Communicator and a pressure source or process pressure allows reranging the transmitter when specific 4 and 20 mA points are unknown.

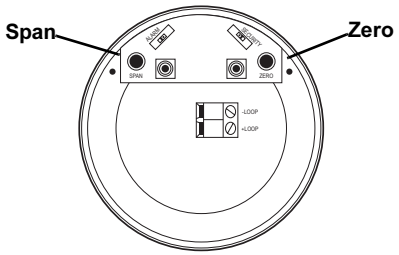
NOTE
The span is maintained when the 4 mA point is set. The span changes when the 20 mA point is set. If the lower range point is set to a value that causes the upper range point to exceed the sensor limit, the upper range point is automatically set to the sensor limit, and the span is adjusted accordingly.

1. From the **HOME** screen, enter the fast key sequence for “Rerange with a Pressure Input Source and a HART Communicator” to configure lower and upper range values and follow the on-line instructions.

Rerange with a Pressure Input Source and the Local Zero and Span buttons (option D1)

The transmitter may be reranged using the local zero and span adjustments and a pressure source.

1. Using a pressure source with an accuracy three to ten times the desired calibrated accuracy, apply a pressure equivalent to the lower range value to the transmitter.
2. Push and hold the zero adjustment button for at least two seconds but no longer than ten seconds.
3. Apply a pressure equivalent to the upper range value to the transmitter.
4. Push and hold the span adjustment button for at least two seconds but no longer than ten seconds.



Rerange with AMS only

Right click on the device and select “Configuration Properties” from the menu. In the Basic Setup tab, locate the Analog Output box and perform the following procedure:

1. Enter the lower range value (LRV) and the upper range value (URV) in the fields provided. Click **Apply**.
2. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
3. After carefully reading the warning provided, select **OK**.

Rerange with a Pressure Input Source and AMS

Right click on the device, select “Calibrate”, then “Apply values” from the menu.

1. Select **Next** after the control loop is set to manual.
2. From the “Apply Values” menu, follow the on-line instructions to configure lower and upper range values.
3. Select **Exit** to leave the “Apply Values” screen.
4. Select **Next** to acknowledge the loop can be returned to automatic control.
5. Select **Finish** to acknowledge the method is complete.

Damping

Fast Keys	1, 3, 6

The damping command introduces a delay in processing which increases the response time of the transmitter; smoothing variations in output readings caused by rapid input changes. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the of loop dynamics of your system. The default damping value is 0.4 seconds and is user-selectable from 0 to 60 seconds.

AMS

Right click on the device and select “Configuration Properties” from the menu.

1. In the “Basic Setup” tab, enter the damping value in the “Damp” field, click **Apply**.
2. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
3. After carefully reading the warning provided, select **OK**.

LCD DISPLAY

The LCD display connects directly to the sensor electronics board which maintains direct access to the signal terminals. The display indicates output and abbreviated diagnostic messages. A display cover is provided to accommodate the display.

The meter features a two-line display and a 0-100% scaled bar graph. The first line of five digits displays the actual value, the second line of six characters displays engineering units and “Error” displays on both lines when the transmitter is in alarm. The LCD display can also display diagnostic messages.

LCD Display Configuration

Fast Keys	1, 3, 7

The Meter Options command customizes the LCD display. The LCD display display will alternate between the items selected. Configure the meter to display the following information to suit your application needs:

- Engineering Units
- Percent of Range
- Scaled Variable
- Temperature

AMS

Right click on the device and select “Configuration Properties” from the menu.

1. In the “Device” tab, locate the “LCD Display Configuration” area. Select the desired options to suit your application needs, click **Apply**.
2. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
3. After carefully reading the warning provided, select **OK**.

DETAILED SETUP

Failure Mode Alarm and Saturation

4500 transmitters automatically and continuously perform self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives the output to configured alarm values. The transmitter will also drive the output to configured saturation values if the applied pressure goes outside the 4-20 mA range values.

The transmitter will drive its output low or high based on the position of the failure mode alarm switch, see “Set Switches” on page 2-5.

NOTE
The failure mode alarm direction can also be configured using the HART Communicator or AMS.

4500 transmitters have three configurable options for failure mode alarm and saturation levels:

- Rosemount (Standard), see Table 3-1
- NAMUR, see Table 3-2
- Custom, see Table 3-3

Table 3-1. Rosemount (Standard) Alarm and Saturation Values

Level	4–20 mA Saturation	4–20 mA Alarm
Low	3.9 mA	≤ 3.75 mA
High	20.8 mA	≥ 21.75 mA

Table 3-2. NAMUR-Compliant Alarm and Saturation Values

Level	4–20 mA Saturation	4–20 mA Alarm
Low	3.8 mA	≤ 3.6 mA
High	20.5 mA	≥ 22.5 mA

Table 3-3. Custom Alarm and Saturation Values

Level	4–20 mA Saturation	4–20 mA Alarm
Low	3.7 mA — 3.9 mA	3.6 mA — 3.8 mA
High	20.1 mA — 21.5 mA	20.2 mA — 23.0 mA

Failure mode alarm and saturation levels can be configured using a HART Communicator or AMS, see “Alarm and Saturation Level Configuration” on page 3-12. Per Table 3-3, custom alarm and saturation levels can be configured between 3.6 mA and 3.9 mA for low values and between 20.1 mA and 23 mA for high values. The following limitations exist for custom levels:

- Low alarm level must be less than the low saturation level
- High alarm level must be higher than the high saturation level
- High saturation level must not exceed 21.5 mA
- Alarm and saturation levels must be separated by at least 0.1 mA

The HART Communicator or AMS will provide an error message if a configuration rule is violated.

Alarm and Saturation Level Configuration

Fast Keys	1, 4, 2, 7

To configure alarm and saturation levels with a HART Communicator or AMS perform the following procedure:

HART Communicator

1. From the **HOME** screen, follow the fast key sequence for “Alarm and Saturation Levels”.
2. Select 7, **Config. Alarm Level** to configure alarm levels.
3. Select **OK** after setting the control loop to manual.
4. Select **OK** to acknowledge current settings.
5. Select desired setting, if “OTHER” is selected enter HI and LO custom values.
6. Select **OK** to acknowledge the loop can be returned to automatic control.
7. Select 8, **Config. Sat. Levels** to configure saturation levels.
8. Repeat steps 3-6 to configure saturation levels.

AMS

Right click on the device, select “Device Configuration”, then select “Alarm/Saturation Levels,” then “Alarm Levels” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Click **Next** after acknowledging the current alarm levels.
3. Select the desired alarm settings: NAMUR, Rosemount, Other
4. If “Other” is selected, enter desired “HI Value” and “LO Value” custom values.
5. Click **Next** to acknowledge new alarm levels.
6. Select **Next** to acknowledge the loop can be returned to automatic control.
7. Select **Finish** to acknowledge the method is complete.
8. Right click on the device, select “Device Configuration,” then select “Alarm/Saturation Levels,” then “Alarm Levels” from the menu.
9. Select **Saturation Levels**.
10. Repeat steps 2 - 8 to configure saturation levels.

Alarm and Saturation Levels for Burst Mode

Transmitters set to burst mode handle saturation and alarm conditions differently.

Alarm Conditions:

- Analog output switches to alarm value
- Primary variable is burst with a status bit set
- Percent of range follows primary variable
- Temperature is burst with a status bit set

Saturation:

- Analog output switches to saturation value
- Primary variable is burst normally
- Temperature is burst normally

Alarm and Saturation Values for Multidrop Mode

Transmitters set to multidrop mode handle saturation and alarm conditions differently.

Alarm Conditions:

- Primary variable is sent with a status bit set
- Percent of range follows primary variable
- Temperature is sent with a status bit set

Saturation:

- Primary variable is sent normally
- Temperature is sent normally

Alarm Level Verification

If the transmitter electronics board, Transmitter, or LCD display is repaired or replaced, verify the transmitter alarm level before returning the transmitter to service. This feature is also useful in testing the reaction of the control system to a transmitter in an alarm state. To verify the transmitter alarm values, perform a loop test and set the transmitter output to the alarm value (see Tables 3-1 and 3-2 on page 3-12, and “Loop Test” on page 3-19).

Process Alerts

Fast Keys	1, 4, 3, 5

Process alerts allow the user to configure the transmitter to output a HART message when the configured data point is exceeded. Process alerts can be set for pressure, temperature, or both. A process alert will be transmitted continuously if the pressure or temperature set points are exceeded and the alert mode is **ON**. An alert will be displayed on a HART Communicator, AMS status screen or in the error section of the LCD display. The alert will reset once the value returns within range.

NOTE
HI alert value must be higher than the LO alert value. Both alert values must be within the pressure or temperature sensor limits.

HART Communicator

To configure the process alerts with a HART Communicator, perform the following procedure:

1. From the **HOME** screen, follow the fast key sequence for “Process Alerts.”
2. Select 3, “Config Press Alert” to configure the pressure alert.
   Select 4, “Config Temp Alert” to configure the temperature alerts.
3. Use the right arrow key to configure the HI and LO alert values.
4. Use the left arrow to move back to the process alert menu.
   Select 1, “Press Alert Mode” to turn on the pressure alert mode.
   Select 2, “Temp Alert Mode” to turn on the temperature alert mode.

AMS

Right click on the device and select “Configuration Properties” from the menu.

1. In the “Analog Output” tab, locate the “Configuration Pressure Alerts” box, enter “Press Hi Alert Val” and “Press Lo Alert Val” to configure the pressure alerts.
2. Configure “Press Alert Mode” to “ON” or “OFF” using the drop down menu.
3. In the “Configuration Temperature Alerts” box, enter “Temp Hi Alert Val” and “Temp Lo Alert Val” to configure the temperature alerts.
4. Configure “Temp Alert Mode” to “ON” or “OFF” using the drop down menu and click **Apply**.
5. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
6. After carefully reading the warning provided, select **OK**.

Scaled Variable Configuration

Fast Keys	1, 4, 3, 4, 7

The scaled variable configuration allows the user to create a relationship/conversion between the pressure reading and custom units.

The scaled variable configuration defines the following items:

- Scaled variable units - Custom units to be displayed.
- Scaled data options - Defines the transfer function for the application
  a. Linear
  b. Square root
- Pressure value position 1 - Lower known value point (possible 4 mA point) with consideration of linear offset.
- Scaled variable value position 1 - Custom unit equivalent to the lower known value point (The lower known value point may or may not be the 4 mA point.)
- Pressure value position 2 - Upper known value point (possible 20 mA point)
- Scaled variable value position 2 - This is the custom unit equivalent to the upper known value point (possible 20 mA point)
- Linear offset - The value required to zero out pressures effecting the desired pressure reading.

NOTE
If Scaled Variable is mapped as the primary variable and square root mode is desired, select Square Root during Scaled Variable Configuration or as part of the set output configuration. Avoid duplication of Square Root configuration.

HART Communicator

To configure the scaled variable with a HART Communicator, perform the following procedure:

1. From the **HOME** screen follow the fast key sequence for “Scaled Variable Configuration.”
2. Select **OK** after the control loop is set to manual.
3. Enter the scaled variable units.
   a. Units can be up to six characters long and include A — Z, 0 — 9, -, /,%, and *.
   b. The first character is always an asterisk (*), which identifies the units displayed are scaled variable units.
4. Select the **Linear Function**, which will prompt for two data points.
5. Enter pressure value position 1. Pressure values must be within the range of the transmitter. Enter the lower known value point considering any linear offset.
6. Enter scaled variable position 1. Enter the lower known value point; this value must be no longer than seven digits.
7. Enter pressure value position 2. Pressure values must be within the range of the transmitter.
   a. Enter the upper known value point.
8. Enter scaled variable position 2.
   a. Enter custom unit equivalent to the upper known value point; this value must be no longer than seven digits.
9. Enter linear offset.
10. Select **OK** to acknowledge that the loop can be returned to automatic control.

AMS

Right click on the device and select “Device Configuration” then select “SV Config” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Enter desired scaled variable units in “Enter SV units” box and click **Next**.
3. Select scaled data option: Linear and click **Next**.
4. Enter pressure value position 1 and click **Next**.
5. Enter scaled variable position 1 and click **Next**.
6. Enter pressure value position 2 and click **Next**.
7. Enter scaled variable position 2 and click **Next**.
8. Enter linear offset and click **Next**. Skip to Step 12.
9. Select **Next** to acknowledge that “Pressure and Scaled Variable values for position 0 set to 0.”
10. Enter pressure value position 1 and click **Next**.
11. Enter scaled variable position 1 and click **Next**.
12. Select **Next** to acknowledge that the loop can be returned to automatic control.
13. Select **Finish** to acknowledge the method is complete.

Re-mapping

Fast Keys	1, 4, 3, 6, 4

The re-mapping function allows the transmitter primary, secondary, and tertiary variables to be configured as desired. Default configuration for transmitter variables is as shown below:

Primary variable = Pressure
Secondary variable = Temperature
Tertiary variable = Scaled Variable

NOTE
The variable assigned as the primary variable drives the 4-20 mA analog output.

The scaled variable can be remapped as the primary variable if desired.

HART Communicator

From the **HOME** screen, enter the fast key sequence for “Re-mapping.”

1. Select **OK** after the control loop is set to manual (see “Setting the Loop to Manual” on page 3-2).
2. Choose desired primary variable and select **Enter**.
3. Choose desired secondary variable and select **Enter**.
4. Select **OK** to acknowledge the tertiary variable setting.
5. Select **OK** to acknowledge that the loop can be returned to automatic control.

AMS

Right click on the device and select “Device Configuration,” then “Re-mapping” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Choose desired primary variable then click **Next**.
3. Choose desired secondary variable then click **Next**.
4. Select **Next** to confirm tertiary variable setting.
5. Select **Next** to acknowledge the loop can be returned to automatic control.
6. Select **Finish** to acknowledge the method is complete.

Sensor Temperature Unit

Fast Keys	1, 4, 1, 2, 2

The Sensor Temperature Unit command selects between Celsius and Fahrenheit units for the sensor temperature. The sensor temperature output is accessible via HART only.

AMS

Right click on the device and select “Configuration Properties” from the menu.

1. In the “Process Input” tab, use the drop down menu “Snsr temp unit” to select F (Farenheit) or C (Celsius). Click **Apply**.
2. Click **Next** to acknowledge send warning.
3. Select **Finish** to acknowledge the method is complete.
4. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
5. After carefully reading the warning, select **OK**.

DIAGNOSTICS AND SERVICE

Diagnostics and service functions listed below are primarily for use after field installation. The Transmitter Test feature is designed to verify that the transmitter is operating properly, and can be performed either on the bench or in the field. The Loop Test feature is designed to verify proper loop wiring and transmitter output, and should only be performed after you install the transmitter.

Transmitter Test

Fast Keys	1, 2, 1, 1

The Transmitter Test command initiates a more extensive diagnostics routine than that performed continuously by the transmitter. The test routine can quickly identify potential electronics problems. If the test detects a problem, messages to indicate the source of the problem are displayed on the HART Communicator screen.

AMS

Right click on the device and select “Diagnostics and Test,” then “Self test” from the menu.

1. Click **Next** to acknowledge test results.
2. Select **Finish** to acknowledge the method is complete.

Loop Test

Fast Keys	1, 2, 2

The Loop Test command verifies the output of the transmitter, the integrity of the loop, and the operations of any recorders or similar devices installed in the loop.

HART Communicator

To initiate a loop test, perform the following procedure:

1. Connect a reference meter to the transmitter by either connecting the meter to the transmitter test terminals, or shunting transmitter power through the meter at some point in the loop.
2. From the **HOME** screen, enter the fast key sequence for “Loop Test” to verify the output of the transmitter.
3. Select **OK** after the control loop is set to manual (see “Setting the Loop to Manual” on page 3-2).
4. Select a discrete milliamp level for the transmitter to output. At the **CHOOSE ANALOG OUTPUT** prompt select 1: 4mA, select 2: 20mA, or select 3: “Other” to manually input a value.
   a. If you are performing a loop test to verify the output of a transmitter, enter a value between 4 and 20 mA.
   b. If you are performing a loop test to verify alarm levels, enter the milliamp value representing an alarm state (see Tables 3-1, 3-3, and 3-2 on page 3-12).
5. Check the reference meter installed in the test loop to verify that it displays the commanded output value.
   a. If the values match, the transmitter and the loop are configured and functioning properly.
   b. If the values do not match, the current meter may be attached to the wrong loop there may be a fault in the wiring, the transmitter may require an output trim, or the reference meter may be malfunctioning.

After completing the test procedure, the display returns to the loop test screen to choose another output value or to end loop testing.

AMS

Right click on the device and select “Diagnostics and Test,” then “Loop test” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Select desired analog output level. Click **Next**.
3. Click **Next** to acknowledge output being set to desired level.
4. Check the reference meter installed in the test loop to verify that it displays the commanded output value.
   a. If the values match, the transmitter and the loop are configured and functioning properly.
   b. If the values do not match, the current meter may be attached to the wrong loop there may be a fault in the wiring, the transmitter may require an output trim, or the reference meter may be malfunctioning.

After completing the test procedure, the display returns to the loop test screen to choose another output value or to end loop testing.

5. Select **End** and click **Next** to end loop testing.
6. Select **Next** to acknowledge the loop can be returned to automatic control.
7. Select **Finish** to acknowledge the method is complete.

ADVANCED FUNCTIONS FOR HART PROTOCOL

Saving, Recalling, and Cloning Configuration Data

Fast Keys	left arrow, 1, 2

Use the cloning feature of the HART Communicator or the AMS “User Configuration” feature to configure several 4500 transmitters similarly. Cloning involves configuring a transmitter, saving the configuration data, then sending a copy of the data to a separate transmitter. Several possible procedures exist when saving, recalling, and cloning configuration data. For complete instructions refer to the HART Communicator manual (publication no. 00809-0100-4276) or AMS on-line guides. One common method is as follows:

HART Communicator

1. Completely configure the first transmitter.
2. Save the configuration data:
   a. Select **F2 SAVE** from the HART Communicator **HOME/ONLINE** screen.
   b. Ensure that the location to which the data will be saved is set to **MODULE**. If it is not, select 1: Location to set the save location to **MODULE**.
   c. Select 2: Name, to name the configuration data. The default is the transmitter tag number.
   d. Ensure that the data type is set to **STANDARD**. If the data type is NOT **STANDARD**, select 3: “Data Type”, to set the data type to **STANDARD**.
   e. Select **F2 SAVE**.
3. Connect and power the receiving transmitter and HART Communicator.

4. Select the back arrow from the **HOME/ONLINE** screen. The HART Communicator menu appears.
5. Select 1: Offline, 2: Saved Configuration, 1: Module Contents to reach the **MODULE CONTENTS** menu.
6. Use the **DOWN ARROW** to scroll through the list of configurations in the memory module, and use the **RIGHT ARROW** to select and retrieve the required configuration.
7. Select 1: Edit.
8. Select 1: Mark All.
9. Select **F2 SAVE**.
10. Use the **DOWN ARROW** to scroll through the list of configurations in the memory module, and use the **RIGHT ARROW** to select the configuration again.
11. Select 3: “Send” to download the configuration to the transmitter.
12. Select **OK** after the control loop is set to manual.
13. After the configuration has been sent, select **OK** to acknowledge that the loop can be returned to automatic control.

When finished, the HART Communicator informs you of the status. Repeat Steps 3 through 13 to configure another transmitter.

NOTE
The transmitter receiving cloned data must have the same software version (or later) as the original transmitter.

AMS creating a Reusable Copy

To create a reusable copy of a configuration perform the following procedure:

1. Select View then User Configuration View from the menu bar (or click the toolbar button).
2. In the User Configuration window, right click and select New from the context menu.
3. In the New window, select a device from the list of templates shown, and click **OK**.
4. The template is copied into the User Configurations window, with the tag name highlighted; rename it as appropriate and press **Enter**.

NOTE
A device icon can also be copied by dragging and dropping a device template or any other device icon from AMS Explorer or Device Connection View into the User Configurations window.

The “Compare Configurations” window appears, showing the Current values of the copied device on one side and mostly blank fields on the other (User Configuration) side.

5. Transfer values from the current configuration to the user configuration as appropriate or enter values by typing them into the available fields.
6. Click Apply to apply the values, or click **OK** to apply the values and close the window.

AMS Applying a User Configuration

Any amount of user configurations can be created for the application. They can also be saved, and applied to connected devices or to devices in the Device List or Plant Database.

NOTE
When using AMS Revision 6.0 or later, the device to which the user configuration is applied, must be the same model type as the one created in the user configuration. When using AMS Revision 5.0 or earlier, the same model type and revision number are required.

To apply a user configuration perform the following procedure:

1. Select the desired user configuration in the User Configurations window.
2. Drag the icon onto a like device in AMS Explorer or Device Connection View. The Compare Configurations window opens, showing the parameters of the target device on one side and the parameters of the user configuration on the other.
3. Transfer parameters from the user configuration to the target device as desired, Click **OK** to apply the configuration and close the window.

Burst Mode

Fast Keys	1, 4, 3, 3, 3

When configured for burst mode, the 4500 provides faster digital communication from the transmitter to the control system by eliminating the time required for the control system to request information from the transmitter. Burst mode is compatible with the analog signal. Because the HART protocol features simultaneous digital and analog data transmission, the analog value can drive other equipment in the loop while the control system is receiving the digital information. Burst mode applies only to the transmission of dynamic data (pressure and temperature in engineering units, pressure in percent of range, and/or analog output), and does not affect the way other transmitter data is accessed.

Access to information other than dynamic transmitter data is obtained through the normal poll/response method of HART communication. A HART Communicator, AMS or the control system may request any of the information that is normally available while the transmitter is in burst mode. Between each message sent by the transmitter, a short pause allows the HART Communicator, AMS or a control system to initiate a request. The transmitter will receive the request, process the response message, and then continue “bursting” the data approximately three times per second.

HART Communicator

To configure the transmitter for burst mode, perform the following step:

1. From the HOME screen, enter the fast key sequence for “Burst Mode.”

AMS

Right click on the device and select “Configuration Properties” from the menu.

1. In the “HART” tab, use the drop down menu to select “Burst Mode ON or OFF.” For “Burst option” select the desired properties from the drop down menu. Burst options are as follows:
   - PV
   - % range/current
   - Process vars/crnt
   - Process variables
2. After selecting options click **Apply**.
3. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
4. After carefully reading the warning provided, select **OK**.

MULTIDROP COMMUNICATION

Multidropping transmitters refers to the connection of several transmitters to a single communications transmission line. Communication between the host and the transmitters takes place digitally with the analog output of the transmitters deactivated. Up to fifteen transmitters can be connected on a single twisted pair of wires, or over leased phone lines.

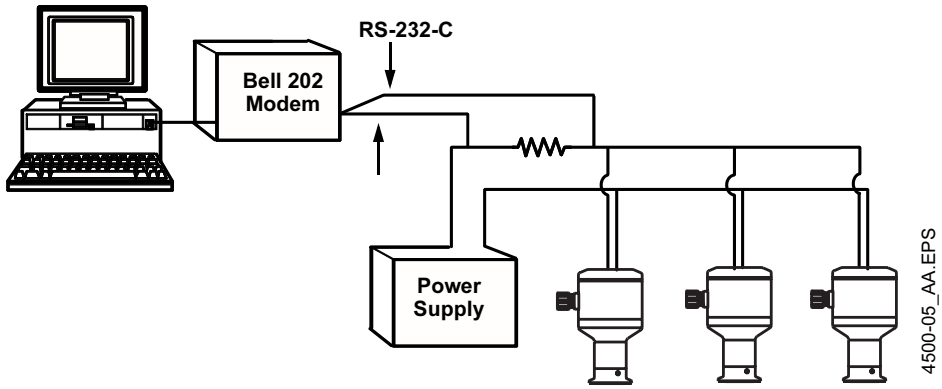
Multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Communication with transmitters can be accomplished with Bell 202 modems and a host implementing HART protocol. Each transmitter is identified by a unique address (1–15) and responds to the commands defined in the HART protocol. HART Communicators and AMS can test, configure, and format a multidropped transmitter the same way as a transmitter in a standard point-to-point installation.

Figure 3-3 shows a typical multidrop network. This figure is not intended as an installation diagram.

NOTE

A transmitter in multidrop mode has the analog output fixed at 4 mA. If a display is installed to a transmitter in multidrop mode, it will alternate the display between “current fixed” and the specified meter output(s).

Figure 3-3. Typical Multidrop Network



The 4500 is set to address zero (0) at the factory, which allows operation in the standard point-to-point manner with a 4–20 mA output signal. To activate multidrop communication, the transmitter address must be changed to a number from 1 to 15. This change deactivates the 4–20 mA analog output, sending it to 4 mA. It also disables the failure mode alarm signal, which is controlled by the upscale/downscale switch position. Failure signals in multidropped transmitters are communicated through HART messages.

Changing a Transmitter Address

Fast Keys	1, 4, 3, 3, 1

To activate multidrop communication, the transmitter poll address must be assigned a number from 1 to 15, and each transmitter in a multidropped loop must have a unique poll address.

HART Communicator

1. From the **HOME** screen, enter the fast key sequence for “Changing a Transmitter Address.”

AMS

Right click on the device and select “Configuration Properties” from the menu.

1. In the “HART” tab, in “ID” box, enter poll address located in the “Poll addr” box, click **Apply**.
2. An “Apply Parameter Modification” screen appears, enter desired information and click **OK**.
3. After carefully reading the warning provided, select **OK**.

Communicating with a Multidropped Transmitter

Fast Keys	Left arrow, 4, 1, 1

HART Communicator

To communicate with a multidropped transmitter, configure the HART Communicator to poll for a non-zero address.

1. From the **HOME** screen, enter the fast key sequence for “Communicating with a Multidropped Transmitter.”
2. On the polling menu, scroll down and select “Digital Poll.” In this mode, the HART Communicator automatically polls for devices at addresses 0-15 upon start up.

AMS

Click on the HART modem icon and select “Scan All Devices.”

Polling a Multidropped Transmitter

Fast Keys	Left arrow, 4, 1

Polling a multidropped loop determines the model, address, and number of transmitters on the given loop.

HART Communicator

1. From the **HOME** screen, enter the fast key sequence for “Polling a Multidropped Transmitter.”

AMS

Click on the HART modem icon and select “Scan All Devices.”

Section 4 Operation and Maintenance

Calibration for HART Protocol . . . . . page 4-1

OVERVIEW

This section contains information on commissioning and operating 4500 Pressure Transmitters. Tasks that should be performed on the bench prior to installation are explained in this section.

HART Communicator and AMS instructions are given to perform configuration functions. For convenience, HART Communicator fast key sequences are labeled “Fast Keys” for each software function below the appropriate headings.

CALIBRATION FOR HART PROTOCOL

Calibrating a 4500 transmitter may include the following procedures:

- Rerange: Sets the 4 and 20 mA points at required pressures.
- Sensor Trim: Adjusts the position of the factory characterization curve to optimize performance over a specified pressure range, or to adjust for mounting effects.
- Analog Output Trim: Adjusts the analog output to match the plant standard or the control loop.

The 4500 Transmitter uses a microprocessor that contains information about the sensor’s specific characteristics in response to pressure and temperature inputs. A smart transmitter compensates for these sensor variations. The process of generating the sensor performance profile is called factory characterization. Factory characterization also provides the ability to readjust the 4 and 20 mA points without applying pressure to the transmitter.

Trim and rerange functions are also distinct and different. Reranging sets the analog output to the selected upper and lower range points and can be done with or without an applied pressure. Reranging does not change the factory characterization curve stored in the microprocessor. Sensor trimming requires an accurate pressure input and improves compensation by adjusting the position of the factory characterization curve to optimize performance over a specific pressure range.

NOTE
Sensor trimming adjusts the position of the factory characterization curve. It is possible to degrade performance of the transmitter if the trim is done improperly or with inaccurate equipment.

Table 4-1. Recommended Calibration Tasks

Transmitter	Bench Calibration Tasks	Field Calibration Tasks
4500_ G 4500_ A	1. Set output configuration parameters: a. Set the range points. b. Set the output units. c. Set the output type. d. Set the damping value. 2. *Optional*: Perform a full sensor trim if equipment available (accurate pressure source required), otherwise perform the low trim value section of the full sensor trim procedure. 3. *Optional*: Perform an analog output trim (Accurate multimeter required)	1. Reconfigure parameters if necessary. 2. Perform low trim value section of the full sensor trim procedure to correct for mounting position effects.

NOTE:
The transmitter performs to specification only when completely and correctly calibrated, including full sensor and analog output trim.

Calibration Overview

Complete calibration of the 4500 pressure transmitter involves the following tasks:

Configure the output parameters

- Set Process Variable Units (page 3-7)
- Set Output Type (page 3-8)
- Rerange (page 3-8)
- Set Damping (page 3-10)

Calibrate the sensor

- Full Trim (page 4-6)
- Zero Trim (page 4-6)

Calibrate the 4–20 mA output

- 4–20 mA Output Trim (page 4-8); or
- 4–20 mA Output Trim Using Other Scale (page 4-9)

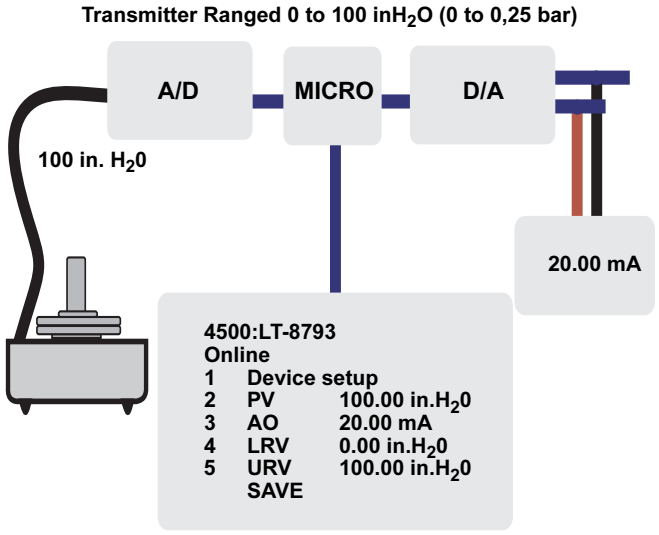
Figure 4-1 on page 4-3 illustrates 4500 transmitter data flow. Data flow can be summarized in four major steps:

1. A change in pressure is measured by a change in the sensor output (Sensor Signal).
2. The sensor signal is converted to a digital format that is understood by the microprocessor (Analog-to-Digital Signal Conversion).
3. Corrections are performed in the microprocessor to obtain a digital representation of the process input (Digital PV).
4. The Digital PV is converted to an analog value (Digital-to-Analog Signal Conversion).

Figure 4-1 also identifies the approximate transmitter location for each calibration task. Data flows from left to right, and a parameter change affects all values to the right of the changed parameter.

Not all calibration procedures should be performed for each 4500 transmitter. Some procedures are appropriate for bench calibration, but should not be performed during field calibration. Table 4-1 identifies the recommended calibration procedures for bench or field calibration.

Figure 4-1. Transmitter Data Flow with Calibration Options



NOTE
Value on PV line should equal the input pressure.
Value on AO line should equal the output device reading.

Determining Calibration Frequency

Calibration frequency can vary greatly depending on the application, performance requirements, and process conditions. Use the following procedure to determine calibration frequency that meets the needs of your application.

1. Determine the performance required for your application.
2. Determine the operating conditions.
3. Calculate the Total Probable Error (TPE).
4. Calculate the stability per month.
5. Calculate the calibration frequency.

Sample Calculation

Step 1: Determine the performance required for your application.

Required Performance: 0.60% of span

Step 2: Determine the operating conditions.

Transmitter: 4500, Range 2 (URL=150 psi),
Calibrated Span: 100 psi
Ambient Temperature Change: ± 50 °F

Step 3: Calculate total probable error (TPE).

TPE = $\sqrt{(\text{ReferenceAccuracy})^2 + (\text{TemperatureEffect})^2}$ = 0.27% of span

Where:

Reference Accuracy = ± 0.15% of span

Ambient Temperature Effect =

$$\pm\left(0.2\%\text{CS} + \frac{0.02\%\ \text{URL}}{\text{span}}\right)\text{per } 50\ ^\circ\text{F} = \pm 0.23\%\ \text{of span}$$

Step 4: Calculate the stability per month.

$$\text{Stability} = \pm\left[\frac{0.1\%\ \text{URL}}{\text{span}}\right](\%\ \text{of span for 3 years}) = \pm 0.0042\%\ \text{of span}$$

Step 5: Calculate calibration frequency.

$$\text{Cal. Freq.} = \frac{(\text{Req. Performance} - \text{TPE})}{\text{Stability per Month}} = \frac{(0.6\% - 0.27\%)}{0.0042\%} = 78.6\ \text{months}$$

Choosing a Trim Procedure

To decide which trim procedure to use, you must first determine whether the analog-to-digital section or the digital-to-analog section of the transmitter electronics need calibration. Refer to Figure 4-1 and perform the following procedure:

1. Connect a pressure source, a HART Communicator or AMS, and a digital readout device to the transmitter.
2. Establish communication between the transmitter and the HART Communicator.
3. Apply pressure equal to the upper range point pressure.
4. Compare the applied pressure to the Process Variable (PV) line on the HART Communicator On-line Menu or the Primary Variables screen in AMS.
   a. If the PV reading does not match the applied pressure (with high-accuracy test equipment), perform a sensor trim.
5. Compare the Analog Output (AO) line, on the HART Communicator or AMS, to the digital readout device.
   a. If the AO reading does not match the digital readout device (with high-accuracy test equipment), perform an output trim.

Sensor Trim

Trim the sensor using either full or zero trim functions. Trim functions vary in complexity and are application-dependent. Both trim functions alter the transmitter's interpretation of the input signal.

Zero trim is a single-point adjustment. It is useful for compensating for mounting position effects and is most effective when performed with the transmitter installed in its final mounting position. Since this correction maintains the slope of the characterization curve, it should not be used in place of a full trim over the full sensor range.

When performing a zero trim, ensure that the equalizing valve is open and all wet legs are filled to the correct levels.

NOTE
Do not perform a zero trim on 4500 Absolute pressure transmitters. Zero trim is zero based, and absolute pressure transmitters reference absolute zero. To correct mounting position effects on a 4500 Absolute Pressure Transmitter, perform a low trim within the full sensor trim function. The low trim function provides a "zero" correction similar to the zero trim function, but it does not require zero-based input.

Full trim is a two-point sensor calibration where two end-point pressures are applied, and all output is linearized between them. Always adjust the low trim value first to establish the correct offset. Adjustment of the high trim value provides a slope correction to the characterization curve based on the low trim value. The factory-established characterization curve is not changed by this procedure. The trim values allow you to optimize performance over your specified measuring range at the calibration temperature.

Zero Trim

Fast Keys	1, 2, 3, 3, 1

NOTE
The transmitter must be within three percent of true zero (zero-based) in order to calibrate with zero trim function.

HART Communicator

Calibrate the sensor with a HART Communicator using the zero trim function as follows:

1. Vent the transmitter and attach a HART Communicator to the measurement loop.
2. From the **HOME** screen, follow the fast key sequence for “Zero Trim.”
3. Follow the commands provided by the HART Communicator to complete the zero trim adjustment.

AMS

Right click on the device and select “Calibrate,” then “Zero trim” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Click **Next** to acknowledge warning.
3. Click **Next** after applying appropriate pressure to sensor.
4. Select **Next** to acknowledge the loop can be returned to automatic control.
5. Select **Finish** to acknowledge the method is complete.

Full Trim

Fast Keys	1, 2, 3, 3

NOTE
Use a pressure input source that is at least three times more accurate than the transmitter, and allow the input pressure to stabilize for ten seconds before entering any values.

HART Communicator

To calibrate the sensor with a HART Communicator using the full trim function, perform the following procedure:

1. Assemble and power the entire calibration system including a transmitter, HART Communicator, power supply, pressure input source, and readout device.
2. From the **HOME** screen, enter the fast key sequence below for “Full Trim.”
3. Select 2: Lower sensor trim

NOTE
Select pressure input values so that low and high values are equal to or outside the 4 and 20 mA points. Do not attempt to obtain reverse output by reversing the high and low points. The transmitter allows approximately five percent URL deviation from the characterized curve established at the factory.

4. Follow the commands provided by the HART Communicator to complete the adjustment of the lower value.
5. Repeat the procedure for the upper value, replacing 2: Lower sensor trim with 3: Upper sensor trim in Step 3.

AMS

Right click on the device and select “Calibrate,” then “Sensor trim” from the menu.

1. Select “Lower sensor trim.”
2. Click **Next** after setting the control loop to manual.
3. Click **Next** after applying appropriate pressure to sensor.
4. Select **Next** to acknowledge the loop can be returned to automatic control.
5. Select **Finish** to acknowledge the method is complete.
6. Right click on the device and select “Calibrate,” select “Sensor trim” from the menu.
7. Select “Upper sensor trim” and repeat steps 2-5.

Recall Factory Trim

The Recall Factory Trim commands allow the restoration of the as-shipped factory settings of the sensor trim and analog output trim.

Recall Factory Trim—Sensor Trim

Fast Keys	1, 2, 3, 4, 1

This command resets the transmitter sensor trim to the “as shipped” factory settings. The Recall Factory Trim—Sensor Trim command can be useful for recovering from an inadvertent zero trim of an absolute pressure unit or inaccurate pressure source.

AMS

Right click on the device and select “Calibrate,” then “Recall Factory Trim” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Select “Sensor trim” under “Trim to recall” and click **Next**.
3. Click **Next** to acknowledge restoration of trim values is complete.
4. Select **Next** to acknowledge the loop can be returned to automatic control.
5. Select **Finish** to acknowledge the method is complete.

Recall Factory Trim—Analog Output

Fast Keys	1, 2, 3, 4, 2

This command resets the transmitter analog output trim to the “as shipped” factory settings. The Recall Factory Trim—Analog Output command can be useful for recovering from an inadvertent trim, incorrect Plant Standard or faulty meter.

AMS

Right click on the device and select “Calibrate,” then “Recall Factory Trim” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Select “Analog output trim” under “Trim to recall” and click **Next**.
3. Click **Next** to acknowledge restoration of trim values is complete.
4. Select **Next** to acknowledge the loop can be returned to automatic control.
5. Select **Finish** to acknowledge the method is complete.

Analog Output Trim

The Analog Output Trim commands allow you to adjust the transmitter’s current output at the 4 and 20 mA points to match the plant standards. This command adjusts the digital to analog signal conversion (see Figure 4-1 on page 4-3).

Digital-to-Analog Trim

Fast Keys	1, 2, 3, 2, 1

HART Communicator

To perform a digital-to-analog trim with a HART Communicator, perform the following procedure.

1. From the **HOME** screen, enter the fast key sequence for “Digital-to-Analog Trim.” Select **OK** after setting the control loop to manual, see “Setting the Loop to Manual” on page 3-2.
2. Connect an accurate reference ammeter to the transmitter at the **CONNECT REFERENCE METER** prompt. Connect the positive lead to the positive terminal and the negative lead to the test terminal in the transmitter terminal compartment, or shunt power through the reference meter at some point.
3. Select **OK** after connecting the reference meter.
4. Select **OK** at the **SETTING FLD DEV OUTPUT TO 4 MA** prompt. The transmitter outputs 4.0 mA.
5. Record the actual value from the reference meter, and enter it at the **ENTER METER VALUE** prompt. The HART Communicator prompts you to verify whether or not the output value equals the value on the reference meter.
6. Select 1: Yes, if the reference meter value equals the transmitter output value, or 2: No if it does not.
   a. If 1 is selected: Yes, proceed to Step 7.
   b. If 2 is selected: No, repeat Step 5.
7. Select **OK** at the **SETTING FLD DEV OUTPUT TO 20 MA** prompt, and repeat Steps 5 and 6 until the reference meter value equals the transmitter output value.
8. Select **OK** after the control loop is returned to automatic control.

AMS

Right click on the device and select “Calibrate,” then “D/A Trim” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Click **Next** after connecting the reference meter.
3. Click **Next** at the “Setting fld dev output to 4mA” screen.
4. Record the actual value from the reference meter, and enter it at the “Enter meter value” screen and click **Next**.
5. Select **Yes**, if the reference meter value equals the transmitter output value, or **No** if it does not. Click **Next**.
   a. If Yes is selected, proceed to Step 6.
   b. If No is selected, repeat Step 4.
6. Click **Next** at the “Setting fld dev output to 20mA” screen.
7. Repeat Step 4 - Step 5 until the reference meter equals the transmitter output value.
8. Select **Next** to acknowledge the loop can be returned to automatic control.
9. Select **Finish** to acknowledge the method is complete.

Digital-to-Analog Trim Using Other Scale

Fast Keys	1, 2, 3, 2, 2

The Scaled D/A Trim command matches the 4 and 20 mA points to a user selectable reference scale other than 4 and 20 mA (for example, 1 to 5 volts if measuring across a 250 ohm load, or 0 to 100 percent if measuring from a Distributed Control System (DCS)). To perform a scaled D/A trim, connect an accurate reference meter to the transmitter and trim the output signal to scale, as outlined in the Output Trim procedure.

NOTE
Use a precision resistor for optimum accuracy. If you add a resistor to the loop, ensure that the power supply is sufficient to power the transmitter to a 20 mA output with additional loop resistance.

AMS

Right click on the device and select “Calibrate,” then “Scaled D/A trim” from the menu.

1. Click **Next** after setting the control loop to manual.
2. Select **Change** to change scale, click **Next**.
3. Enter Set scale-Lo output value, click **Next**.
4. Enter Set scale-Hi output value, click **Next**.
5. Click **Next** to proceed with Trim.
6. Click **Next** after connecting the reference meter.
7. Click **Next** at the “Setting fld dev output to 4 mA” screen.
8. Record the actual value from the reference meter, and enter it at the “Enter meter value” screen and click **Next**.
9. Select **Yes**, if the reference meter value equals the transmitter output value, or **No** if it does not. Click **Next**.

a. If Yes is selected, proceed to Step 10.
b. If No is selected, repeat Step 8.

10. Click **Next** at the “Setting fld dev output to 20mA” screen.
11. Repeat Step 8 - Step 9 until the reference meter equals the transmitter output value.
12. Select **Next** to acknowledge the loop can be returned to automatic control.
13. Select **Finish** to acknowledge the method is complete.

Diagnostic Messages

In addition to output, the LCD display displays abbreviated operation, error, and warning messages for troubleshooting. Messages appear according to their priority; normal operating messages appear last. To determine the cause of a message, use a HART Communicator or AMS to further interrogate the transmitter. A description of each LCD diagnostic message follows.

Error Indicator

An error indicator message appears on the LCD display to warn of serious problems affecting the operation of the transmitter. The meter displays an error message until the error condition is corrected, and analog output is driven to the specified alarm level. No other transmitter information is displayed during an alarm condition.

FAIL MODULE

The transmitter is malfunctioning. Possible sources of problems include:

- Pressure or temperature updates are not being received in the Transmitter.
- A non-volatile memory fault that will affect transmitter operation has been detected in the module by the memory verification routine.

Some non-volatile memory faults are user-repairable. Use a HART Communicator or AMS to diagnose the error and determine if it is repairable. Any error message that ends in “Factory” is not repairable.

FAIL CONFIG

A memory fault has been detected in a location that could effect transmitter operation, and is user-accessible. To correct this problem, use a HART Communicator or AMS to interrogate and reconfigure the appropriate portion of the transmitter memory.

Warnings

Warnings appear on the LCD display to alert you of user-repairable problems with the transmitter, or current transmitter operations. Warnings appear alternately with other transmitter information until the warning condition is corrected or the transmitter completes the operation that warrants the warning message.

PV LIMIT

The process variable read by the transmitter is outside of the transmitter’s range.

NONPV LIMIT

A secondary variable read by the transmitter is outside of the transmitter's range.

CURR SAT

The pressure read by the module is outside of the specified range, and the analog output has been driven to saturation levels.

LOOP TEST

A loop test is in progress. During a loop test or 4–20 mA trim, the analog output is set to a fixed value. The meter display alternates between the current selected in milliamps and "LOOP TEST."

XMTR INFO

A non-volatile memory fault has been detected in the transmitter memory by the memory verification routine. The memory fault is in a location containing transmitter information. To correct this problem, use a HART Communicator or AMS to interrogate and reconfigure the appropriate portion of the transmitter memory. This warning does not effect the transmitter operation. Contact Rosemount Customer Central at 800-999-9307 if you need assistance.

PRESS ALERT

A HART alert when the process variable read by the transmitter is outside of the user set alert limits.

TEMP ALERT

A HART alert when the secondary temperature variable read by the transmitter is outside of the user set alert limits.

Operation

Normal operation messages appear on the LCD display to confirm actions or inform you of transmitter status. Operation messages are displayed with other transmitter information, and warrant no action to correct or alter the transmitter settings.

ZERO PASS

The zero value, set with the local zero adjustment button, has been accepted by the transmitter, and the output should change to 4 mA.

ZERO FAIL

The zero value, set with the local zero adjustment button, exceeds the maximum range down allowed for a particular range, or the pressure sensed by the transmitter exceeds the sensor limits.

SPAN PASS

The span value, set with the local span adjustment button, has been accepted by the transmitter, and the output should change to 20 mA.

SPAN FAIL

The span value, set with the local span adjustment button, exceeds the maximum range down allowed for a particular range, or the pressure sensed by the transmitter exceeds the sensor limits.

KEYS DISABL

This message appears during reranging with the integral zero and span buttons and indicates that the transmitter local zero and span adjustments have been disabled. The adjustments have been disabled by software commands from the HART Communicator or AMS. Keys are not detected when write protect jumper is active. See “Security (Write Protect)” on page 2-5 for information on the software lockout.

STUCK KEY

The zero or span button is stuck in the depressed state or pushed too long.

Section 5 Troubleshooting

OVERVIEW

Table 5-1 provides summarized maintenance and troubleshooting suggestions for the most common operating problems.

If you suspect malfunction despite the absence of any diagnostic messages on the HART Communicator display, follow the procedures described here to verify that transmitter hardware and process connections are in good working order. Always deal with the most likely checkpoints first.

SAFETY MESSAGES

Procedures and instructions in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that raises potential safety issues is indicated by a warning symbol (⚠). Refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Static electricity can damage sensitive components.

- Observe safe handling precautions for static-sensitive components.

Table 5-1. Rosemount 4500 troubleshooting table

Symptom	Corrective Actions
Transmitter milliamp reading is zero	Verify power is applied to signal terminals Check power wires for reversed polarity Verify terminal voltage is 11.25 to 30 V dc Check for open diode across test terminal
Transmitter Not Communicating with HART Communicator	Verify the output is between 4 and 20 mA or saturation levels Verify clean DC Power to transmitter (Max AC noise 0.2 volts peak to peak) Check loop resistance, 250 Ω minimum (PS voltage -transmitter voltage/loop current) Check if unit is addressed properly
Transmitter milliamp reading is low or high	Verify applied pressure Verify 4 and 20 mA range points Verify output is not in alarm condition Verify if 4 – 20 mA output trim is required
Transmitter will not respond to changes in applied pressure	Check test equipment Verify applied pressure is between the 4 and 20 mA set points Verify output is not in alarm condition Verify transmitter is not in Loop Test mode
Digital Pressure Variable reading is low or high	Check test equipment (verify accuracy) Verify transmitter is calibrated properly Verify pressure calculations for application
Digital Pressure Variable reading is erratic	Check application for faulty equipment in pressure line Verify transmitter is not reacting directly to equipment turning on/off Verify damping is set properly for application
Milliamp reading is erratic	Verify power source to transmitter has adequate voltage and current Check for external electrical interference Verify transmitter is properly grounded Verify shield for twisted pair is only grounded at one end

Appendix A Reference Data

Specifications . . . . . **page A-1**
Dimensional Drawings . . . . . **page A-5**
Ordering Information . . . . . **page A-8**

SPECIFICATIONS

Performance Specifications

For zero-based spans, reference conditions, Neobee M-20 oil fill, SST materials, 1 1/2 in. tri-clamp process connections, digital trim values set to equal range points.

Conformance to specification (±3 Sigma)

Technology leadership, advanced manufacturing techniques and statistical process control ensure specification conformance to at least ±3 sigma.

Reference Accuracy

Includes the effects of terminal based linearity, hysteresis, and repeatability.

±0.15% of calibrated span (CS) from 1:1 to 15:1 rangedown

$\pm 0.01\left(\frac{URL}{Span}\right)$% of calibrated span from 15:1 to 50:1 rangedown on Range 1 GP

Long Term Stability

0.1% of Upper Range Limit (URL) for 3 years under normal operating conditions

Batch to Batch Repeatability
One batch is an exposure to a Clean in Place / Steam in Place (CIP/SIP) process with maximum temperature of 400°F (204°C) for 2 hours.

±0.025 psi (0.0017 bar) for 100 batches

Vibration Effect

Less than ±0.1% of URL when tested per the requirements of IEC 60770 control room level

RFI Effects

±0.15% of span from 20 MHz to 1000 MHz for field strength up to 10 V/m.

Range and Sensor Limits

Rosemount 4500 Sanitary Pressure Transmitter Range Limits						
	Range 1 AP		Range 1 GP		Range 2	
Units	min.	max.	min.	max.	min.	max.
psi	0.60	30	0.6	30	10	150
kPa	4.14	206.8	4.136	206.8	68.94	1034
bar	0.041	2.068	0.04136	2.068	0.689	10.34
kg/cm^2	0.042	2.109	0.04218	2.109	0.703	10.54

Functional Specifications

Dynamic Performance

250 milliseconds (response time + dead time)

Ambient Temperature Effect per 50°F (28°C)

±0.2% CS ± 0.02% URL

Process Temperature Effect per 104°F (58°C)

±0.3% CS + 0.03% URL

Service

Liquid, gas, vapor, and steam applications

4–20 mA (output code A)

Zero and Span Adjustment

Zero and span values can be set anywhere within the range.
Span must be greater than or equal to the minimum span.

Output

Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

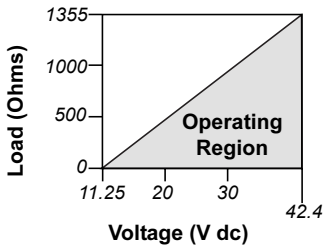
Power Supply

External power supply required. Standard transmitter (4–20 mA) operates on 11.25 to 42.4 V dc with no load.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

Max. Loop Resistance = 43.5 (Power Supply Voltage – 11.25)



Communication requires a minimum loop resistance of 250 ohms.

Overpressure Limits

Transmitters withstand the following pressure without damage:

Range 1: 150 psi (10.34 bar)

Range 2: 300 psi (20.68 bar)

Burst Pressure Limits

Range 1: 300 psi (20.68 bar)

Range 2: 450 psi (31.02 bar)

Temperature Limits

Ambient

32 to 140 °F (0 to 60 °C)

Storage

–22 to 185 °F (–30 to 85 °C)

Process Temperature Limits

32 to 400°F (0 to 204°C)

Horizontal Mount

For process temperatures above 293°F (145°C), derate ambient temperature by 7°F (4°C) for every 18°F (10°C) increase in process temperature.

Top Mount

For process temperatures above 266°F (130°C), derate ambient temperature by 9°F (5°C) for every 18°F (10°C) increase in process temperature.

Vacuum Application

Process vacuums in excess of 200 mmHg requires derating process temperature to 212°F (100°C).

Turn-On Time

Performance within specifications less than 2.0 seconds after power is applied to the transmitter

Damping

Analog output response to a step input change is user-selectable from 0 to 60 seconds for one time constant. This software damping is in addition to sensor module response time.

Failure Mode Alarm

HART 4-20mA (output code A)

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven offscale to alert the user. Rosemount standard and custom alarm levels are available.

High or low alarm signal is software-selectable.

Alarm Configuration

Rosemount
High Alarm: ≥ 21.75 mA
Low Alarm: ≤ 3.75 mA

Custom Level (1)
High Alarm: 20.2 - 23.0 mA
Low Alarm: 3.6 - 3.8 mA

Humidity Limits

0-100% relative humidity

Physical Specifications

Process Connections

- 1½ inch Tri-Clamp Connection
- 2 inch Tri-Clamp Connection
- 1½ inch Fractional Line Connection

Process-Wetted Parts

Process Isolating Diaphragms
316L SST
Hastelloy C-276®

Surface Finish
15 µ-inch Ra mechanically polished
10 µ-inch Ra electropolished

Non-Wetted Parts

Electronics Housing
304 SST
NEMA 4X
IP 66

Surface Finish
32 µ-inch Ra mechanically polished

Sensor Module Fill Fluid

Neobee M-20

Shipping Weight for Rosemount 4500

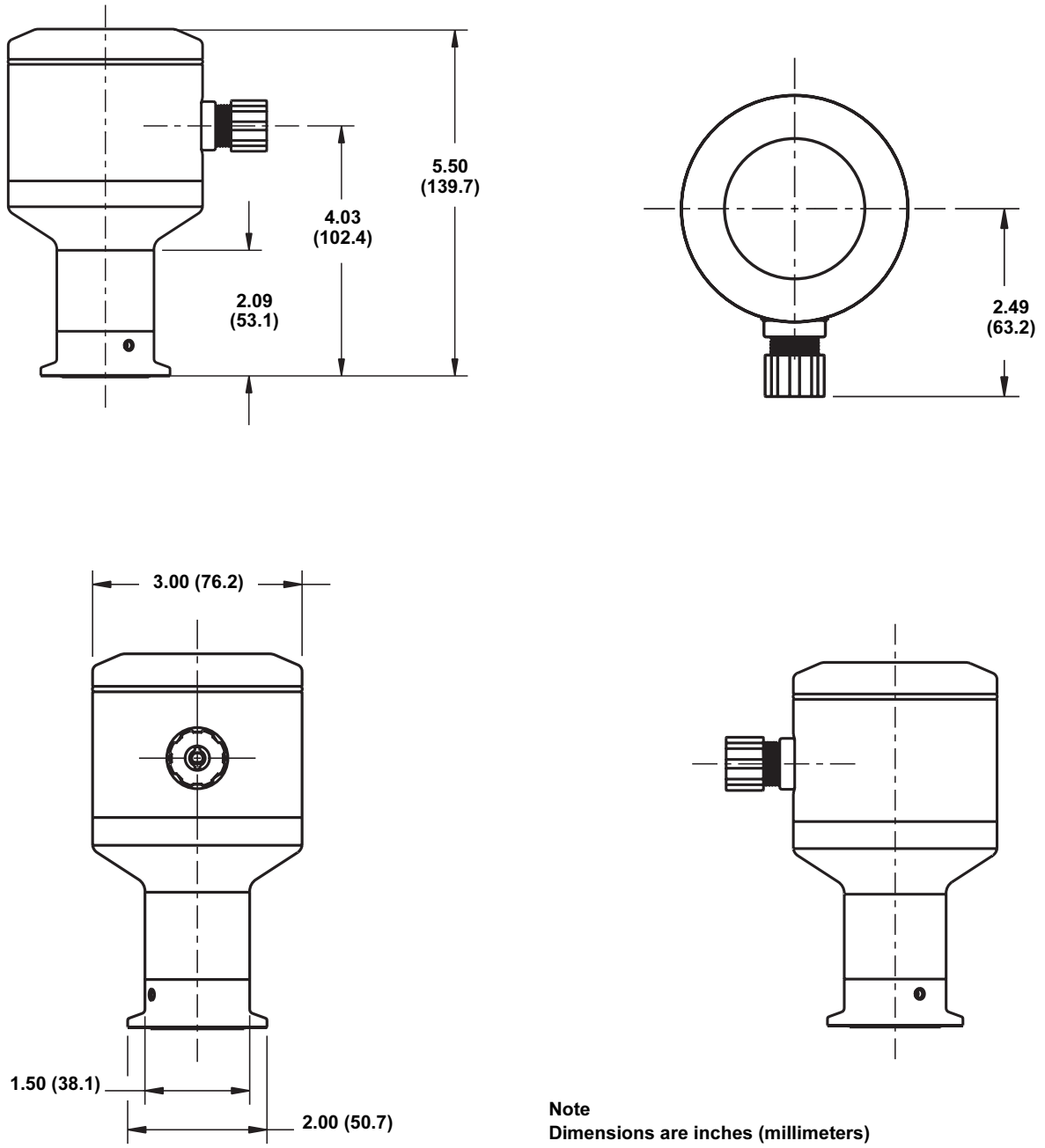
3.0 lb. (1.36 kg.)

(1) Low alarm must be 0.1 mA less than low saturation and high alarm must be 0.1 mA greater than high saturation.

DIMENSIONAL DRAWINGS

FIGURE 1. Dimensional Drawings for the Rosemount 4500 Hygienic Pressure Transmitter

1 1/2 inch Tri-Clamp Module

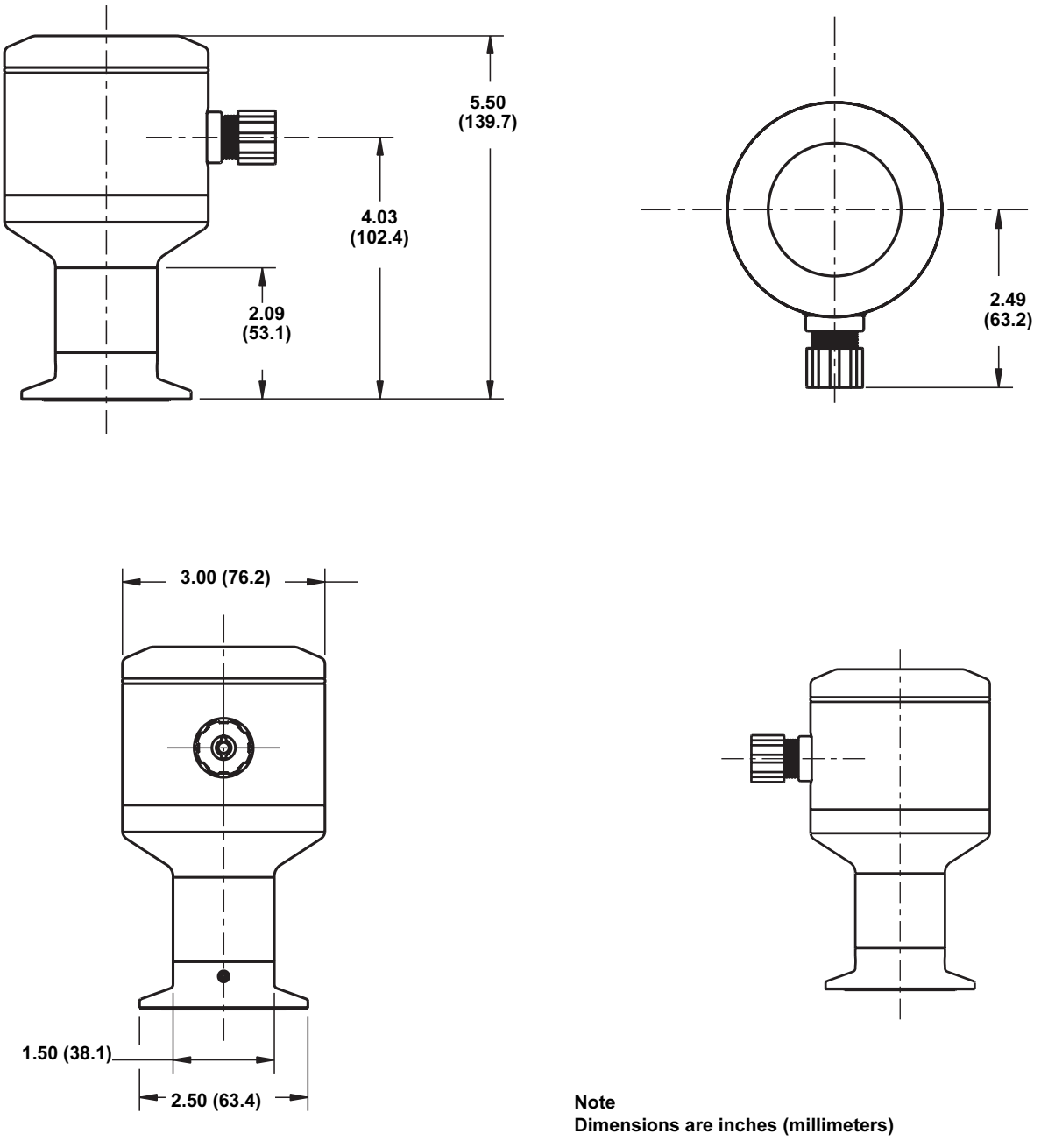


Note
Dimensions are inches (millimeters)

4500_01_AA, 4500_02_AA, 4500_03_AA, 4500_04_AA.EPS

FIGURE 2. Dimensional Drawings for the Rosemount 4500 Hygienic Pressure Transmitter

2 inch Tri-Clamp Module

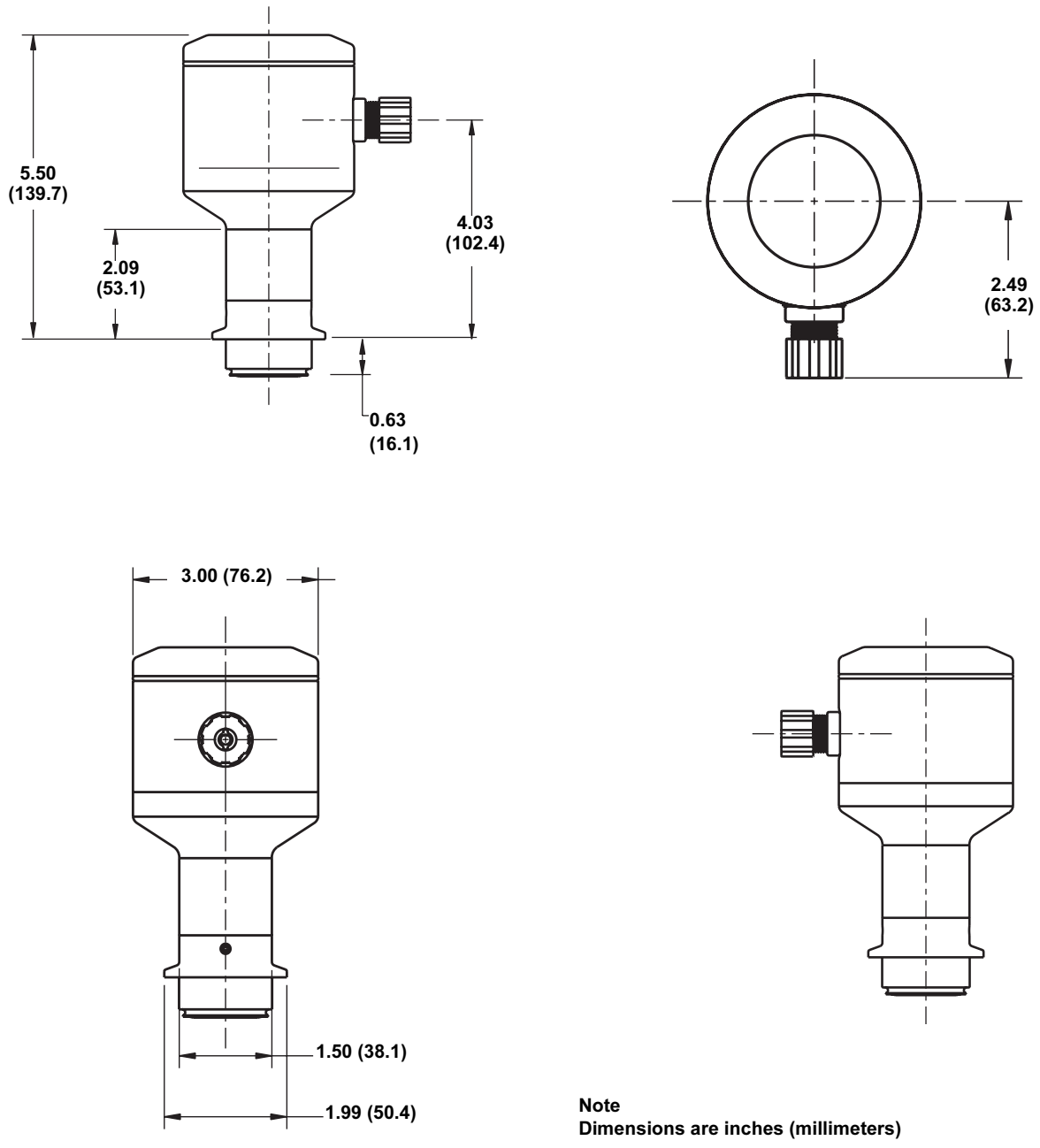


Note
Dimensions are inches (millimeters)

4500_10_AA, 4500_11_AA, 4500_12_AA, 4500_13_AA.EPS

FIGURE 3. Dimensional Drawings for the Rosemount 4500 Hygienic Pressure Transmitter

Fractional Line Fitting Module



Note
Dimensions are inches (millimeters)

4500_20_AA, 4500_21_AA, 4500_22_AA, 4500_23_AA.EPS

ORDERING INFORMATION

Model	Transmitter Type	
4500	Hygienic Pressure Transmitter	
Code	**Measurement Type**	
G	Gauge	
A	Absolute	
Code	**Pressure Range**	
	Gauge	**Absolute**
1	-14.7 to 30 psi	0 to 30 psia
2	-14.7 to 150 psi	0 to 150 psia
Code	**Wetted Materials**	
2	316L SST	
3	Hastelloy C-276	
Code	**Process Connection Style**	
C11	1-1/2 inch Tri-Clamp Connection	
C12	2 inch Tri-Clamp Connection	
C13	1-1/2 inch Fractional Line Fitting Connection	
Code	**Oil Fill**	
A	Neobee M-20	
Code	**Transmitter Output**	
A	4-20 mA with Digital Signal Based on HART protocol	
Code	**Cable Entry**	
2A	Cable Gland	
Code	**Options**	
	Surface Finish	
F1	Electro polished to 10 µ-inch Ra	
	Software Configuration	
C1	Custom Software Configuration (CDS required with order)	
	Alarm Limits	
C6	Custom Alarm & Saturation Signal Levels, High Alarm	
C7	Custom Alarm & Saturation Signal Levels, Low Alarm	
	Hardware Adjustments	
D1	Zero & Span Adjustments	
	Digital Display	
M5	LCD Display	
	Calibration Data Certificate	
Q4	Calibration data certificate consistent with ISO 10474 2.1 or EN 10204 2.1	
QP	Calibration Certificate and Tamper Evident Seal	
	Material Traceability Certification	
Q8	Material traceability certification per EN 10204 3.1.B	
	Surface Finish Certification	
Q16	Surface Finish Certification	
Code	**Product Certifications**	
I1	ATEX Intrinsic Safety	
I5	FM Approvals Intrinsically Safe	
I6	CSA Intrinsically Safe	
N1	ATEX Type n	
Typical Model Number: 4500 G 2 2 C12 A A 2A		

Appendix B Product Certificates

Approved Manufacturing Locations . . . . . page B-1
Ordinary Locations Certifications . . . . . page B-1
European Directive Information . . . . . page B-1
Hazardous Locations Certifications . . . . . page B-2

APPROVED MANUFACTURING LOCATIONS

Rosemount Inc. — Chanhassen, Minnesota, USA

ORDINARY LOCATIONS CERTIFICATIONS

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

N0 Factory Mutual (FM) Ordinary Location;
Canadian Ordinary Location
CE Marking
3-A Symbol Authorization #876
EHEDG Type EL[(1)]
Certified to meet Hygienic Equipment Design Criteria of Document 8 per TNO evaluation #V6069 and certificate #C05-6288

EUROPEAN DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

European Pressure Equipment Directive (PED) (97/23/EC)

Rosemount 4500 Pressure Transmitters- Sound Engineering Practice

Electro Magnetic Compatibility (EMC) (89/336/EEC)

All Models: EN 50081-1: 1992; EN 50082-2:1995;
EN 61326-1:1997/ A1 1998– Industrial

(1) Not applicable to 1.5-in. fractional line version.

HAZARDOUS LOCATIONS CERTIFICATIONS

North American Certifications

Factory Mutual (FM) Approvals

I5 Intrinsically Safe for use in Class I, II, III, Division 1,
Groups A, B, C, D, E, F, and G;
Temperature Code T4 (T_{amb} = 0 to 60°C);
Intrinsically Safe for use in Class I, Zone 0 AEx ia IIC
T4 (T_{amb} = 0 to 60°C);
Non-incendive for Class I, Division 2, Groups A, B, C, and D;
When connected in accordance with
Rosemount drawing 04500-5001;
Enclosure Type 4X
For entity parameters see control drawing 04500-5001;

Canadian Standards Association (CSA) Approvals (Pending)

I6 Intrinsically Safe for use in Class I, Division 1,
Groups A, B, C, and D;
Temperature Code T3C (T_{amb} = 0 to 60°C);
Intrinsically Safe for use in Class I, Zone 0 Ex ia IIC
T4 (T_{amb} = 0 to 60°C);
When connected in accordance with
Rosemount drawing 04500-5002;
Enclosure Type 4X
For entity parameters see control drawing 04500-5002;

European Certifications

I1 ATEX Intrinsic Safety
Certificate No. Baseefa05ATEX0091X
ATEX Marking: ⟨Ex⟩ II 1 G
EEx ia IIC T4 (T_{amb} = 60°C)
IP66

CE 1180
Input Parameters:
U_i = 30V
I_i = 200mA
P_i = 1.0W
C_i = 0nF
L_i = 2.4μH

Special Conditions For Safe Use (x)

The plastic meter cover does not meet the surface resistivity requirements and, to avoid electrostatic charging, it must not be rubbed or cleaned with solvents.

N1 ATEX Type n (Pending)
Certificate No. Baseefa05ATEX0092X
ATEX Marking: ⟨Ex⟩ II 3 G
EEx nA nL IIC T5 (T_{amb} = 60°C)
U_i = 42.4V MAXIMUM
IP66
CE

Special Conditions For Safe Use (x)

The plastic meter cover does not meet the surface resistivity requirements and, to avoid electrostatic charging, it must not be rubbed or cleaned with solvents.

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Reference Manual
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Rosemount 4500

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